FINAL

RISK ASSESSMENT OF OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT

Prepared by

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MAY 23, 2011

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BALTIMORE, MARYLAND

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ABS	Dermal Absorption Factor
ADI	Average Daily Intake
AF	Adherence Factor
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
AVS	Acid Volatile Sulfides
AWQC	(Federal) Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
$BAF_{org\text{-}sed}$	Sediment Bioaccumulation Factor
BSAF	Biota-Sediment Bioaccumulation Factor
Cal EPA	California EPA
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CI	Confidence Interval
cm^2	Square Centimeter(s)
COC	Chemical of Concern
Coke Point	Coke Point Peninsula
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
DA_{event}	Absorbed Dose Per Event
DL	Detection Limit
DMCF	Dredged Material Containment Facility
EA	EA Engineering, Science, and Technology, Inc.
EcoSSL	Ecological Soil Screening Level
EI	Environmental Indicator
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
EPD	Effective Prediction Domain
ERA	Ecological Risk Assessment
ER-L	Effects Range – Low
ER-M	Effects Range – Medium
ET	Ecotoxicological Threshold
FA	Fraction Absorbed
FERC	Federal Energy Regulatory Commission
FI	Food Ingestion Rate
FOD	Frequency of Detection
FS	Feasibility Study
ft	Foot or Feet

g	Gram(s)
GIABS	Gastrointestinal Dermal Absorption Factor
HHRA	Human Health Risk Assessment
HHRA-PH	Human Health Risk Assessment for Public Health Impacts
HHRA-SC	Human Health Risk Assessment for Source Characterization and Site Planning
HI	Hazard Index
HMW	High Molecular Weight
HQ	Hazard Quotient
IDL	Instrument Detection Limit
IRIS	Integrated Risk Information System
ISG	International Steel Group
kg	Kilogram(s)
kg/kg bw-d	Kilogram(s) Per Kilogram Body Weight Per Day
kg/mg	Kilograms(s) Per Milligram
km	Kilometer(s)
K_{ow}	Octanol/Water Partition Coefficient
L/day	Liter(s) Per Day
L/kg bw-d	Liter(s) Per Kilogram Body Weight Per Day
LADI	Lifetime Average Daily Intake
LMW	Low Molecular Weight
LOAEL	Lowest-Observed-Adverse-Effect Level
MAH	Mono Aromatic Hydrocarbon
MDE	Maryland Department of the Environment
MDL	Method Detection Limit
MES	Maryland Environmental Service
µg/kg	Microgram(s) Per Kilogram
µg/L	Microgram(s) Per Liter
mg/cm^2	Milligram(s) Per Square Centimeter
mg/kg	Milligram(s) Per Kilogram
mg/kg bw-day	Milligram(s) Per Kilogram Body Weight Per Day
mg/kg-day	Milligram(s) Per Kilogram Per Day
mg/L	Milligram(s) Per Liter
mL	Milliliter(s)
MPA	Maryland Port Administration
NAPL	Non-Aqueous Phase Liquid
NRWQC	National Recommended Water Quality Criteria
ND	Non-Detect
NOAEL	No-Observed-Adverse-Effect Level

OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbon
PC	Permeability Coefficient
PCB	Polychlorinated Biphenyl
PEL	Probable Effects Level
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RE&I	Rust Environmental & Infrastructure
RL	Reporting Limit
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SA	Surface Area
SAV	Submerged Aquatic Vegetation
SEM	Simultaneously Extracted Metals
SF	Slope Factor
SIR	Sediment Ingestion Rate
SQB	Sediment Quality Benchmark
SQS	Sediment Quality Standards
SVOC	Semivolatile Organic Compound
SWI	Site Wide Investigation
TCDD	2,3,7,8-Tetrachlorodibenzodioxin
TEF	Toxicity Equivalency Factor
TEL	Threshold Effects Level
TEQ	Toxicity Equivalency Quotient
TRV	Toxicity Reference Value
UCLM	Upper Confidence Limit on the Mean
URS	URS Corporation
USA	United States of America
USACE	United States Army Corps of Engineers
USDOE	United States Department of Energy
USEPA (EPA)	United States Environmental Protection Agency
VOC	Volatile Organic Compound
95%UCLM	95 Percent Upper Confidence Limit on the Mean

Abiotic – Nonliving. An abiotic factor is one that relates to a physical or chemical characteristic of the environment, such as temperature or pH. An abiotic material is a nonliving material, such as water, soil, or sediment.

Acute Effect – An exposure-caused adverse effect on any living organism which results in severe symptoms that develop rapidly; symptoms often subside after the exposure stops.

Adsorption – The clinging of molecules of gas, liquid, or dissolved solids to a surface.

Ambient – The overall existing (i.e. background) conditions.

Anionic – Having a negative charge.

Anoxic – Lacking oxygen.

Aquatic Organism – An animal, such as a fish, that lives in water.

Background Level – An average or expected amount of a substance in a specific environment, or typical amounts of substances that occur naturally in an environment (for example, the amount of iron that occurs naturally in drinking water would be considered the background level).

Benchmark – A standard by which something (such as toxic effect) can be measured.

Benthic Organism (pl. Benthos)– An animal, such as an oyster that lives on, in, or near the bottom of a body of water.

Bioaccumulation − The process by which a substance is taken up by an organism into its body tissue. This uptake may occur through direct exposure to a contaminant, such as contacting contaminated water or breathing contaminated air, or by eating food or drinking liquid that contains a contaminant.

Bioassay – A laboratory test using live organisms to measure biological effects of a substance, factor, or condition. The effect measured may be growth, reproduction, or survival.

Bioavailability − The degree to which a substance can be absorbed or taken in by an organism after exposure to that substance.

Brackish – A mixture of fresh water and salt water.

Cancer Risk – The probability of developing cancer as a result of exposure to an environmental agent or mixture of agents averaged over a lifetime exposure (70 years).

Carcinogen – An agent capable of causing or aggravating cancer.

***Carcinogenic* –** Causing cancer.

***Cationic* –** Having a positive charge.

Central Tendency – In statistics, the general level, characteristic, or typical value that is representative of the majority of cases. Among several accepted measures of central tendency employed in data reduction, the most common are the arithmetic mean (simple average), the median, and the mode.

***Chemical of Concern (COC)* –** Hazardous substances, pollutants, and contaminants that, at the end of the risk assessment, are found to be the *risk drivers* or those that may actually pose unacceptable human or ecological risks. The COCs typically drive the need for a remedial action (USEPA 1999).

***Chemical of Potential Concern (COPC)* –**Generally comprise the hazardous substances, pollutants, and contaminants that are investigated during the baseline risk assessment. The list of COPCs may include all of the constituents whose data are of sufficient quality for use in the quantitative risk assessment, or a subset thereof (USEPA 1999).

Chronic Effect – An exposure-caused long term effect. Consequences develop slowly and (or) have a long-lasting course; may be applied to an effect that develops rapidly and is long lasting.

***Coal Tar* –** A thick black liquid produced by destructively distilling coal. Coal tar may be used in roofing, waterproofing, and insulating compounds, and as a raw material for dyes, drugs, and paints.

***Coke* –** A grey, hard, porous material produced by destructively distilling coal. Coke is used as fuel and as a reducing agent in smelting iron ore in a blast furnace.

***Coking* –** The production of coke by destructively distilling coal.

***Concentration* –** The relative amount of a substance in an environmental medium, expressed by relative mass (such as milligrams per kilogram, mg/kg), volume (such as milliliters per liter, ml/L), or number of units (such as parts per million, ppm).

***Conceptual Site Model (CSM)* –** A planning tool used to organize information about a site and to identify additional information needed to achieve project goals, such as cleanup. In risk assessment, this involves identifying sources, media, receptors, fate and transport pathways, and exposure pathways.

***Confidence Interval (CI)* –** An interval estimate, that is, a range of values around an estimate point that takes sampling error into account. Ninety-five percent is an accepted standard of confidence. Technically, a 95% CI means that if repeated samples were drawn from the same population using the same sampling and data collection procedures, the true population value would fall within the confidence interval 95% of the time.

Confidence Limit – The lower and upper values of a confidence interval (an estimated range of values likely to include a parameter). The confidence limits define the range of the confidence interval.

Contaminant – A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Dermal Contact – Contact with (touching) the skin.

Desorption – The release of a substance that has adsorbed (clung to) a surface.

Dioxins – A group of chemically-related compounds which share chemical structures similar to dibenzo-p-dioxin that are persistent environmental pollutants that accumulate in the food chain, mainly in the fatty tissue of animals. These chemicals are toxic and can cause reproductive and developmental problems, damage the immune system, and are considered likely to be carcinogenic to humans.

Dissolved Concentration – The amount per volume of chemical that has passed into a solution.

Dose – A measure of exposure. Examples include (1) the amount of a substance ingested, (2) the amount of a substance absorbed, and (3) the product of ambient exposure concentration and the duration of exposure.

Dose-Response – The relationship between exposure and effects.

Ecological Risk Assessment (ERA) – A process in which exposure and toxicity data are evaluated to develop an estimate of the potential for adverse impacts on ecological receptors from chemicals in the environment. The ERA process includes hazard identification, exposure and dose-response assessment, and risk characterization.

Endpoint – An observable or measurable biological event or chemical concentration used to assess the effect of exposure to a substance.

Environmental Indicator (EI)– Simple measures that tell us what is happening in the environment. Since the environment is very complex, indicators provide a more practical and economical way to track the state of the environment than attempting to record every possible variable in the environment.

Epidemiology – The study of the causes, distribution, and control of disease or health status of a population. An epidemiological study attempts to link human health effects to a specific cause.

Effects Range Low (ERL) – A concentration of a chemical in sediment below which toxic effects are rarely observed among sensitive species.

Eutrophication – An increase in the concentration of chemical nutrients in an ecosystem to the extent that primary production is increased.

Exposure – Contact with a substance by swallowing, breathing, or touching the skin or eyes.

Exposure Assessment – An identification and evaluation of how the human population or biota come into contact with a harmful substance, how often and for how long they are in contact with the substance, route of exposure, and how much of the substance they are in contact with.

Exposure Medium – The contaminated environmental medium (such as sediment or surface water) to which an individual is exposed.

Exposure Pathway – The route a substance takes from its source (where it began) to an exposed population. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals at or originating from a site. An exposure pathway has four parts: a source of contamination (such as a former industrial site); an environmental medium and transport mechanism (such as movement through water); a point of exposure (such as a private well); and a route of exposure (such as eating, drinking, breathing, or touching). When all four parts are present, the exposure pathway is considered a complete exposure pathway.

Exposure Point – The potential contact between a person or animal and a contaminant within an exposure medium.

Exposure Point Concentration – The concentration of chemicals that will be contacted over an exposure period from a particular medium or route of exposure.

Exposure Route – The way in which a substance comes in contact with a person or animal (for example, by ingestion, inhalation, or dermal contact).

Exposure Scenario – A set of assumptions concerning how an exposure takes place, including assumptions about the exposure setting, stressor characteristics (factors that cause stress to an organism such as a chemical/biological agent, environmental condition, external stimuli or an event), and activities of an organism that can lead to exposure.

Fate – Disposition of a substance in an environmental medium, such as sediment or water.

Food Chain – A sequence of organisms where each one is eaten in turn by another.

Food Web – A system of organisms containing several inter-related food chains.

Geometric Mean – A type of mean or average, which indicates the central tendency or typical value of a set of numbers. It is similar to the arithmetic mean, except that the numbers are multiplied and then the *n*th root (where n is the count of numbers in the set) of the resulting product is taken. A geometric mean ins calculated where a set of numbers is lognormally distributed.

Guild – A group of animals that use the same resources in the same way.

Habitat – The place where a population (human or animal) lives, including its living and non-living surroundings.

Hazard Index (HI) – The sum of hazard quotients for multiple substances or exposure pathways.

Hazard Quotient (HQ) − The ratio of estimated site-specific exposure to a single chemical over a specified period of time to the estimated daily exposure level, at which no adverse health effects are likely to occur.

Herbivorous – Plant-eating.

Human Health Risk Assessment (HHRA) – A formal process, including data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization, used to estimate current and possible future risk to human receptors if no action were taken to clean up a contaminated site.

Ingestion – The act of swallowing something through eating, drinking, or putting something in one's mouth. A contaminant can enter the body this way.

Invertebrate – An animal, such as a crab or worm, that does not have a backbone.

Lines of Evidence (Weight of Evidence) – Information that can be used to describe and interpret estimates of risk.

Lowest-Observed-Adverse-Effect Level (LOAEL) – The lowest tested dose of a substance reported to cause biologically significant increases in frequency or severity of adverse effects between the exposed population (people or biota) and its appropriate control group.

Mean – Average. The mean is calculated by adding all values in a set, then dividing by the total number of values.

Media – Specific environmental elements, such as water, soil, and air, which are the subject of regulatory concern and activities. Singular: Medium.

Median – The middle number in a sorted list of values; the numeric value separating the higher half of a sample, a population, or a probability distribution, from the lower half.

Mesohaline – Moderately brackish water. Mesohaline water has a salinity (the percentage of salt in water) of 5 to 18 parts per thousand.

Method Detection Limit – The lowest concentration of a substance that can be distinguished reliably from a concentration of zero given a specific analytical method.

Mutagenic – Causing a mutation (that is, a change to the DNA, genes, or chromosomes of a living organism).

Non-Carcinogen – A substance that does not cause cancer.

Non-Carcinogenic – Not causing cancer.

No-Observed-Adverse-Effect Level (NOAEL) –The highest tested dose of a substance at which there are no biologically significant increases in the frequency or severity of adverse effects between the exposed population (people or biota) and its appropriate control; some effects may be produced at this level, but they are not considered adverse or precursors of adverse effects.

Percentile – Values that divide a sample of data into one hundred groups containing (as far as possible) equal numbers of observations. For example, 50% of the data values lie below the 50th percentile.

Phytoplankton – Plankton (small plants and animals that float or drift in large numbers in water) that obtain energy by photosynthesis (the process of converting sunlight to energy).

Piscivorous – Fish-eating.

Polychlorinated Biphenyls (PCBs) – Man-made chemicals that comprise a group of 209 individual chlorinated biphenyl rings known as congeners. PCBs were typically manufactured as mixtures of 60 to 90 different congeners. As a pollutant, they are of concern because some compounds have been identified as likely to be carcinogenic, toxic, and mutagenic.

Polycyclic Aromatic Hydrocarbon (PAH) – Potent atmospheric pollutants whose chemical structure consists of fused aromatic rings. PAHs occur in oil, coal, and tar deposits, and are produced as byproducts of fuel burning (whether fossil fuel or biomass). As a pollutant, they are of concern because many PAHs have been identified as carcinogenic. Other effects in terrestrial organisms are not well known, but may include adverse effects on reproduction, development, and immunity.

> ***High Molecular Weight (HMW) PAHs*** – Heavier PAHs do not dissolve in water, but stick to solid particles and settle to the sediments in bottoms of lakes, rivers or streams. These PAHs tend to stick to soils and sediments and generally take weeks to months to break down in the environment.
>
> ***Low Molecular Weight (LMW) PAHs***– PAHs that are lighter and can volatize (evaporate) into the air. These PAHs break down by reacting with sunlight and other chemicals in the air. This generally takes days to weeks. The more sunlight, the quicker these PAHs will breakdown.

Population – An entire collection of people, animals, plants, or things from which data are collected.

Qualitative – Based on characteristics, not measurements.

Quantitative – Based on measurement.

Receptor – A person or animal who could come into contact with a substance.

Reference Dose (RfD) – An estimate of a daily oral exposure to humans (including sensitive subgroups) that is likely to not cause significant risk of harmful effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the data used.

Remediation – Cleanup or treatment of media to significantly reduce the quantity of, or remove, a substance in the local environment.

Reporting Limits – The lowest concentration at which a contaminant is reliably quantified.

Resource Conservation and Recovery Act (RCRA) – Enacted in 1976, RCRA gives the EPA the authority to control hazardous waste from start to finish. This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes.

Risk – The probability of harmful effects resulting from exposure to a substance.

Risk Assessment – Qualitative (described) or quantitative (measured) evaluation of risk posed to human health or the environment by the presence, or potential presence of specific substances.

Risk Characterization –The summation and integration of the toxicity and exposure assessments into quantitative and qualitative expressions of risk.

Sample – A portion or piece of a whole; a selected subset of a population or subset of whatever is being studied. For example, an environmental sample (such as a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sediment – Materials such as soil and sand that lie below the surface of the water. Sediment may settle to the bottom or may be suspended in water.

Seep – An area where water trickles out of the ground.

Sensitivity Analysis – A document that provides a context for risk results when more than one set of exposure and toxicity assumptions could be applicable.

Slag – Waste that is left over from the process of smelting and refining metals.

Slope Factor – An upper-bound estimate of a chemical's probability of causing cancer over specified timeframe representing a lifetime, usually expressed in units of proportion (of a population) affected per milligram per kilogram per day (mg/kg-day)

Smelting – The process of melting, especially to extract a metal from its ore (a type of rock that contains minerals with important elements including metals).

Spatial Analysis – A method of analyzing data that uses information about location as well as characteristics.

Surrogate – A substitute; a chemical of similar structure to a chemical of interest. In the ecological risk assessment, benchmarks for surrogate chemicals are sometimes used to evaluate risks from similarly structure target chemicals..

Taxa – Groups or ranks in a biological classification into which related organisms are classified. Singular: Taxon.

Threshold Effects Level (TEL) – Concentration of a substance to which it is believed that most people or biota can be exposed daily without adverse effect (the threshold between safe and dangerous concentrations).

Toxicity Equivalency Quotient (TEQ) – Allows concentrations of less toxic compounds to be expressed as an overall equivalent concentration of the most toxic dioxin, 2,3,7,8-TCDD. These toxicity-weighted concentrations are then summed to give a single concentration expressed as a dioxin toxicity equivalency quotient (TCDD TEQ).

Toxicity – Harmful biological effects caused by a chemical, physical, or biological agent.

Toxicity Assessment – Review of literature, results of toxicity tests, and data from field surveys regarding the toxicity of any given substance to a receptor.

Toxicity Reference Value (TRV) – A numerical value used in risk assessment that represents a substance's exposure-response relationship.

Toxicology – The study of harmful interactions between chemical, physical, or biological agents and biological systems.

Uncertainty – Uncertainty refers to the inability to know for sure—it is often due to incomplete data. For example, when assessing the potential for risks to people, toxicology studies generally involve dosing of test animals such as rats as a substitute for humans. Since it is unknown how differently humans and rats respond, an uncertainty factor is used to account for possible differences. Additional consideration may also be made if there is some reason to believe that the very young are more susceptible than adults, or if key toxicology studies are not available.

Uncertainty Factor (UF) – A mathematical adjustment that is made to account for incomplete knowledge, such as variations in sensitivity between young and old, differences between humans and animals, using data obtained from a study of exposure that is less than a lifetime, and using lowest-observed-adverse-effect data rather than no-observed-adverse-effect data.

Upper Confidence Limit of the Mean (UCLM) – The highest value in a range of values defining the confidence interval around an estimate of the mean for a data set. The 95%UCLM exceeds the true mean 95% of the time.

Uptake – A process by which materials are transferred into an organism.

Volatile Organic Compound (VOC) – Organic chemical compounds that have high enough vapor pressures under normal conditions to vaporize and enter the earth's atmosphere. VOCs can affect the environment and human health. VOCs are typically not acutely toxic but may have chronic effects, including being likely carcinogenic to humans.

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EXECUTIVE SUMMARY

The Sparrows Point Steel Mill Facility is located on approximately 2,300 acres on the north side of the Patapsco River in Baltimore County, Maryland, approximately 9 miles southeast of downtown Baltimore (**Figure ES-1**). The Coke Point Peninsula is part of a site regulated under the Resource Conservation and Recovery Act (RCRA) (USA et al. 1997). The Maryland Port Administration (MPA) has expressed an interest in acquiring the Coke Point Peninsula (Coke Point) on the Sparrows Point property as a potential site for a Dredged Material Containment Facility (DMCF) for placement of dredged material from channels in Baltimore Harbor. Site assessment of the area found that sediment quality is adversely affected adjacent to most of the Coke Point shoreline, and concentrations of polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and metals are elevated above background levels (EA Engineering, Science, and Technology, Inc. [EA] 2009b). MPA requested that a risk assessment of the offshore environment around the Coke Point Peninsula be performed to assess whether the observed impacts to surface sediment and surface water pose risks to natural resources or human health. The risk assessmentwas performed as part of MPA'sdue diligence in evaluating the feasibility of this site for a DMCF.

Figure ES-1. Coke Point Peninsula on the Sparrows Point Facility.

The purpose of this evaluationwas to provide a preliminary assessment of risks for the offshore environments around the Coke Point Peninsula under existing conditions. The risk assessment was conducted to identify site-related risks or remediation needs; to provide a baseline for quantifying potential risk reduction benefits of the proposedDMCF project; and to aid in design of remedial measures.This risk assessment of the area offshore of the Coke Point Peninsula quantifies the risks to both ecological systems and to people who would have access to the offshore area. The risk assessment does not evaluate future hypothetical risks that could occur if site conditions change due to redistribution of chemical concentrations in the sediment profile due to dredging, erosion or mixing.The risk assessment was undertaken to aid the MPA with internal decision making for site planning. The risk assessment for the Coke Point Offshore Area was conducted using methods identified in USEPA guidance (USEPA 1989, 1991, 1992, 1997a, 2002, 2004, 2005b, 2005c).

To support the purposes of the risk assessment, two separate human health risk assessments (HHRAs) are presented. The first HHRA evaluates potential exposure people would experience under the current conditions of the Coke Point offshore area. This HHRA evaluates the Coke Point Offshore Area for an expected low frequency of use as a recreational

area.TheHHRAevaluatedhuman exposures that provide an estimate of a site-specific exposure that takes into account mobility of aquatic organisms in the offshore area.This HHRA is called the Public Health Impact Risk Assessment (HHRA-PH). The second HHRAevaluated human health risks modeled from chemical contributions from the Coke Point Offshore Area.This HHRA was used as a Source Characterization (SC) and Site Planning tool that will aid the MPA with internal decision-making for future site planning. TheHHRA-SC evaluated a more conservative site use assumptionand a theoretical maximum exposure that provides a conservative indication of potential risk contribution from offshore sediment and surface water. The HHRA-SC relied on site-specific bioaccumulation studies rather than field-collected fish and crab to assess the potential contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption.

CONCEPTUAL SITE MODEL (CSM)

A CSM was developed for the Coke Point Peninsula to define potential chemical sources, chemical fate and transport mechanisms, exposure routes, and potential receptors for offshore areas. The CSM identified complete exposure pathways that require quantitative assessment to characterize the potential for risks. The risk assessment focused on pathways that are potentially complete under existing environmental conditions. Potential future risk and exposure to subsurface sediments, due to erosion or dredging,were not considered in the risk assessment. The primary sources of chemicals in the offshore environment are groundwater seeps of VOCs and PAHs and slag/deposited sediments containing metalsand organic compounds. Important transport pathways include movement of chemicals from groundwater and sediment into surface water.

The ecological CSM identified complete exposure pathways for aquatic and benthic organisms and wildlife exposed to surface water and surface sediments. Only sediments within the top foot of the sediment surface were evaluated. The risk assessment considered exposure pathways to subsurface sediment (sediment deeper than 1 foot [ft]) incomplete for ecological receptors under existing conditions. The primary route of exposure for aquatic and benthic organisms is direct exposure, while the primary route for wildlife is ingestion through the food chain and ingested media. Receptor species are selected based on several factors including likelihood of site use, potential for exposure, availability of life history and exposure information, and the availability of toxicity information for the representative receptor species. Great blue heron, osprey, raccoon, and otter were selected as the representative receptor species for birds and mammals that consume prey from aquatic habitats.

For humans, the primary exposure pathways were incidental ingestion and direct contact (dermal contact) with surface water and direct contact with surface sediment by watermen and recreational users, as well as consumption of fish or crabs. Only sediments within the top foot of the sediment surface were evaluated. The risk assessment considered exposure pathways to subsurface sediment (sediment deeper than 1 ft) incomplete for humans under existing conditions. All receptors and complete exposure pathways were evaluated in both HHRAs.

DATA EVALUATED IN THE RISK ASSESSMENT

The risk assessment quantitatively evaluated chemical analytical data from surface sediment, surface water, field-collected crab tissue, field-collected fish tissue, and clam and worm tissue from laboratory bioaccumulation tests. These data were separated into exposure groupings. Data representing the area offshore of Coke Point were grouped as the Coke Point Offshore Area. Data representing background areas were grouped as the Patapsco River Background Area. In total, chemical data were available from 37sediment, 96 surface water, 10 composite fish tissue, and 10 composite crab tissue samplescollected in the Coke Point Offshore Area. Chemical data were also available from 5 composite clam and 5 composite worm tissue samples from laboratory bioaccumulation tests performed using Coke Point sediment. These samples were collected in an area extending approximately 0.5 miles offshore from the Coke Point shoreline, and represent the media most likely to be influenced by potential chemical sources at Coke Point (**Figure ES-2**). For the Patapsco River Background Area, data were available for6 sediment, 9 surface water, 10 composite fish tissue, and 10 composite crab tissue samples. In addition, data were available from 5 composite clam and 5 composite worm tissue samples from laboratory bioaccumulation tests performed using background area sediment. There were additional data available from other portions of the Patapsco River that were not evaluated quantitatively, but are considered qualitatively in the assessment. Data used in the risk assessment originated from the following studies:

- Site Assessment for the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point (EA 2009b);
- Work Plan Addendum, Additional RCRA Facilities Investigation, Sparrows Point Peninsula, Offshore Area, Baltimore, Maryland (EA 2010a);
- Coke Point Dredged Material Containment Facility Pre-Pilot Study Sediment Characterization (EA 2009a);
- FY05 and FY08 Evaluation of Dredged Material: Baltimore Harbor Federal Navigation Channels (EA 2007, 2009c);
- Additional Offshore Delineation: Proposed Coke Point Dredged Material Containment Facility atSparrows Point (EA 2010c);
- Feasibility Studies of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions(EA 2004);
- Reconnaissance Study of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions (EA 2003); and
- Laboratory Bioaccumulation and Field-Collected Tissue Study (EA 2011).

Figure ES-2. Sampling locations around the Coke Point Peninsula

For sediment, only surface grab samples of 1 ft in depth or less were utilized in the assessment. Subsurface sediment samples collected from depth intervals of 0 to 2 ft or deeper were not used in the assessment because these were considered more representative of subsurface sediment, and exposure pathways for subsurface sediment were considered incomplete. Data were validated following U.S. Environmental Protection Agency (USEPA) protocol (USEPA 1992) and data quality evaluated per USEPA guidance (USEPA 1989). Chemical analytical data were used to statistically derive exposure point concentrations (EPCs) for surface sediment, surface water, and aquatic organism (e.g., fish, crab, clams, and worms) tissue exposed to these media. EPCs for aquatic organisms were derived from surface sediment and surface water concentrations using literature-based uptake factors and field-collected tissue concentrations. EPCs were used in the quantitative evaluation of risks. EPCs were selected to represent a screening exposure scenario and a reasonable maximum exposure scenario.

Spatial distributions of offshore chemical concentrations were evaluated in comparison to background concentrations to interpret relative risk. Spatial analysis indicates thatconcentrations of multiple metals(e.g., arsenic, copper, lead, and zinc), polychlorinated biphenyls (PCBs), and PAHs are elevated up to five times or more above background in surface sediment in two general areas: the area to the south and west of the mouth of the Turning Basin; and the area west of the Benzol Processing Area (**Figure ES-2**). Concentrations of metals, PCBs, and PAHsare elevated one to two times above background within a roughly 1,000-ft buffer along the Coke Point shoreline. In surface water, chemical concentrations of high molecular weight (HMW) PAHs, toluene, and ethylbenzene were detected at concentrations in surface water elevated above those in the Patapsco River Background Area. Concentrations of toluene and ethylbenzene in surface water are highest at locations immediately offshore of Coke Point. Concentrations of HMW

PAHs are highest in surface water at locations immediately offshore of Coke Point at locations BH-W-06 and -10B and along the shoreline.

ECOLOGICAL RISK ASSESSMENT (ERA)

An ERA is a process in which exposure and toxicity data are combined to develop an estimate of the potential for adverse impacts on ecological receptors including fish, invertebrates, and wildlife from chemicals in the environment. The ERA for the Coke Point Offshore Area was conducted in accordance with applicable USEPA guidance (USEPA 1997a). The ERA provided separate assessments of risks for two assessment endpoints:

- Viability of aquatic and benthic organism communities, and
- Viability of wildlife communities including piscivorous (fish-eating) birds and mammals.

Per USEPA guidance (USEPA 1997a), the ERA began with a precautionary evaluation of the potential for risks based on screening exposure scenarios. However, it also incorporated more refined evaluation methods, such as reasonable maximum exposure scenarios, consideration of background risks, and discussion of site-specific habitat, wildlife mobility, and bioavailability considerations. The ERA applied a weight-of-evidence approach for each assessment endpoint evaluated. In a weight-of-evidence approach, multiple lines of evidence are evaluated, and their individual significance, or weight, is considered to derive a conclusion. Each line of evidence is a measurement endpoint. Exposure and toxicity assessments were conducted to compile the data necessary to evaluate each of these endpoints.

Assessment of Risks for Aquatic and Benthic Organisms

For aquatic and benthic organisms, the ERA evaluatedseveral measurement endpoints as part of a weight-of-evidence approach. These include comparisons of EPCs in surface sediment and surface water to toxicological benchmarks; comparison of offshore concentrations of chemicals to background concentrations; and consideration of bioavailability based on sediment chemical testing and laboratory bioaccumulation test results. Subsurface sediment was not evaluated in the ERA. Exposure pathways for subsurface sediment are considered incomplete in this evaluation of current conditions.Potential future risk as a result of erosion or dredging was not considered in the ERA.

Results of the ecological risk assessment for aquatic and benthic organisms are provided in **Table ES.1**. For surface sediments, the results of the risk assessment indicated that concentrations of chemicals in surface sediment at Coke Point exceed both benchmarks protective of aquatic and benthic organisms as well as background concentrations. Comparison based on surface sediment concentrations identified metals, PAHs, and PCBs as exceeding threshold and probable effects benchmarks and background risks. These comparisons provide a strong indication that chemical concentrations in sediments in the Coke Point Offshore Area potentially cause risk to aquatic and benthic organisms that cannot be readily attributed to background sources in the Patapsco River. Arsenic, chromium, copper, lead, mercury, zinc, dioxins, HMW PAHs, low molecular weight (LMW) PAHs, and PCBs were identified as the chemicals most likely to cause risks. Site-specific bioavailability information indicated that risk from other metals may be somewhat overestimated because these metals may bind to sediment in

forms that are less toxic. This information was used to focus the list of metals identified as posing risks.

For surface water, the ecological risk assessment also indicatedthat, whilemaximum surface water concentrations of a few chemicals at the Coke Point Offshore Area exceed benchmarksand background risks, overall risks are relatively low and are generally comparable to background with the exception of risks for PAHs. Comparisons based on surface water concentrations identified several metals, ethylbenzene, toluene, and PAHs as exceeding benchmarks. Reasonable maximum case scenario concentrations were generally comparable between the Coke Point Offshore Area and the Patapsco River Background Area or do not exceed benchmarks, with the exception of PAHs. Therefore, the assessment concludes that PAHs are the only chemicals in surface water at Coke Point that are predicted to pose risks to aquatic and benthic organisms above those risks already posed by background sources.

The finding of the ERA is that aquatic and benthic organisms are potentially at risk from metals, PAHs, and PCBs in surface sediment at the Coke Point Offshore Area. Arsenic, chromium, copper, lead, mercury, zinc, PAHs, and PCBs in sediment were considered the chemicals most likely to drive risks, although high concentrations of PAHs in surface water in near-shore areas also contribute to risks. Chemical concentrations in surface sediment throughout the offshore area are elevated and contribute to risks to aquatic and benthic organisms.

Assessment of Risks for Wildlife

The CSM for Coke Point identified the viability of wildlife, including birds and mammals, as an assessment endpoint for protection. Great blue heron, osprey, raccoon, and river otter were selected as specific representative receptor species. Because wildlife may be exposed to multiple media via the food web, measurement endpoints for wildlife were based on food web modeling to estimate ingested doses. Measurement endpoints evaluated for wildlife include comparisons of doses fromprey, surface sediment and surface water to toxicological benchmarks; comparison of offshore doses of chemicals to background doses; and consideration of bioavailability based on sediment chemical testing and laboratory bioaccumulation test results.

The ERA evaluated exposure scenarios based on ingestion of three types of prey (benthos, fish, and crabs). Tissue concentrations representative of benthos were developed using site-specific bioaccumulation factors (BAFs), while tissue concentrations representative of fish and crab were calculated from analyses of specimens field-collected from the areas to be assessed. There are advantages to each of these two methods for calculating tissue concentrations. Laboratory bioaccumulation tests are a highly reliable means of linking exposure to chemical concentrations in sediment to concentrations accumulated in tissue because uptake is not influenced by the mobility of organisms or variations in field conditions. Thus, scenarios based on BAFs from laboratory bioaccumulation tests provide the most reliable measure of potential contributions from chemical sources in Coke Point sediments to regional exposures and risks. Alternatively, concentrations derived from field-collected tissue are more likely to incorporate the influence of field variations and organism movement beyond the site and provide a more reliable measure for predicting the actual exposures experienced by people and wildlife consuming these organisms from the site. Different scenarios were evaluated so that the advantages of each data source could be used to interpret risk assessment results.

Table ES.1. Summary of Ecological Risk Results for Aquatic and Benthic Organisms

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		Qualitative Factors
	Chemicals Exceeding Benchmarks[A]	Chemicals Exceeding Both Benchmarks &Background[B]	Chemicals Exceeding Benchmarks[A]	Chemicals Exceeding Both Benchmarks &Background[B]	
AQUATIC AND BENTHIC ORGANISMS					
Sediment exposures	**Aluminum (1.39)** **Antimony (1.65)** **Arsenic (9.94)** **Cadmium (11.4)** **Chromium (9.64)** **Cobalt (5.30)** **Copper (31.8)** **Iron (6.00)** **Lead (42.3)** **Manganese (3.46)** **Mercury (13.1)** **Nickel (3.55)** Selenium (12.3) **Silver (3.84)** Tin (58.8) Vanadium (2.98) **Zinc (22.0)** **HMW PAH (440)** **LMW PAH (23,300)** PCBs (8.17) **TCDD TEQ (51.4)**	Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Cadmium [4.81] Chromium [2.24] Cobalt [2.68] Copper [5.67] Iron [2.74] Lead [10.58] Manganese [1.26] Mercury [4.36] Nickel [1.51] Selenium [5.13] Silver [2.98] Tin [5.19] Vanadium [1.80] Zinc [6.36] HMW PAH [33.3] LMW PAH [468] PCBs [8.38] TCDD TEQ [3.79]	Aluminum (1.23) Arsenic (3.82) Cadmium (4.39) **Chromium (4.52)** Cobalt (2.94) **Copper (9.20)** **Iron (3.82)** **Lead (11.6)** **Manganese (2.76)** Mercury (5.28) Nickel (2.68) Selenium (4.61) Silver (1.90) Tin (25.1) Vanadium (2.04) **Zinc (8.06)** **HMW PAH (132)** **LMW PAH (7,050)** PCBs (5.52) TCDD TEQ (20.2)	Aluminum [1.09] Arsenic [2.57] Cadmium [2.58] Chromium [1.16] Cobalt [1.48] Copper [1.88] Iron [2.79] Lead [3.32] Manganese [1.01] Mercury [3.02] Nickel [1.74] Selenium [1.92] Silver [1.61] Tin [2.21] Vanadium [1.23] Zinc [2.66] HMW PAH [10.0] LMW PAH [141.3] PCBs [4.98] TCDD TEQ [2.10]	- -Bioaccumulation tests indicate that metals, PAHs, and PCBs are at least partially bioavailable based on observed uptake. - Analyses of sediment indicate that sulfides may bind some metals and decrease their toxicity compared to that assumed in toxicity benchmarks.
Surface water exposures	Aluminum (1.04) Manganese (1.65) Zinc (1.04) HMW PAH (5,420) LMW PAH (3.85) Ethylbenzene (5.48) Toluene (1.53)	Manganese [2.32] Zinc [9.40] HMW PAH [58.9] LMW PAH [4.71]	HMW PAH (438) LMW PAH (1.08)	HMW PAH (ND=DL) [4.76]	

Bolded chemicals in the list of exceedences indicate that concentrations exceed probable effects benchmarks in addition to threshold effects benchmarks; this provides a more definite indication of risks.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

The ERA evaluated five lines of evidence, called measurement endpoints, to characterize risks to wildlife. These included:

- Comparison of modeled food web doses to no-effect and low-effectbenchmarks for birds and mammals using a precautionary screening level scenario assuming exposures to maximum detected concentrations.

- Comparison of modeled food web doses to no-effect and low-effectbenchmarks for birds and mammals using a reasonable maximum scenario based on statistically derived mean concentrations.

- Comparison of risk estimates for the Coke Point Offshore Area to risks for the Patapsco River Background Area.

- Comparison of reasonable maximum scenariofood web doses to no-effect and low-effectbenchmarks after they have been modified with Area Use Factors (AUFs) that account for wildlife movement.

- Qualitative evaluation of chemical bioavailability in sediment.

The first measurement endpoint – evaluation of risks using a precautionary screening scenario – identified numerous chemicals in the Coke Point Offshore Area whose doses exceeded both no-effects and low-effects benchmarks. These included metals, dioxins, PAHs, and PCBs (**Tables ES.2** and **ES.3**). However, the screening scenario is not representative of most exposures experienced by wildlife, and represents a conservative worst case scenario. The reasonable maximum scenario is more reflective of actual exposures within the project site boundary, and the reasonable maximum exposure scenario modified to account for wildlife mobility and area use is likely to be most representative of actual exposures. When a reasonable maximum exposure scenario is considered, several metals, dioxins, PCBs, and PAHs produce doses that exceed no-effects benchmarks, but only the doses of several metals and PCBs exceed low-effects benchmarks (**Tables ES.2** and **ES.3**). Exceedence of a low-effect benchmark is a more definite indicator of risk, while exceedence of a no-effect benchmark indicates that a risk is possible, but not definite. When area use and wildlife mobility were factored into exposures, doses of PCBs and a few metals exceeded low-effects level benchmarks.

Comparison of risks between the Coke Point Offshore Area and Patapsco River Background Area indicates that risks to wildlife from PAHs, PCBs, dioxins, and some metals are higher near Coke Point (**Tables ES.2** and **ES.3**). Risks from many of the metals that produced doses above benchmarks for reasonable maximum scenarios at Coke Point are similar to those in background, indicating that these risks are not limited to Coke Point sources. Alternative statistical evaluation of background data were found to decrease background risks by an order of magnitude as documented in **Appendix G**, thus increasing the difference between ecological risks in the Coke Point Offshore Area and risks in the Patapsco River Background Area.

Table ES.2.Summary of Ecological Risk Results for Avian Wildlife

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		
	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding Low-Effects Level Benchmark[A]
AVIAN WILDLIFE: GREAT BLUE HERON					
Modeled exposures using prey uptake from benthic organisms	Lead (1.22) Vanadium (5.26) HMW PAHs (2.68) LMW PAHs (11.4) PCBs (3.38)	Lead [10.6] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [165] PCBs [8.38]	***Vanadium (3.59)*** LMW PAHs (3.25) PCBs (1.83)	Vanadium [1.23] LMW PAHs [48.1] PCBs [4.98]	No LOAEL chemical exceedances
Modeled exposures using field-collected crabs	LMW PAH (2.00)	LMW PAHs [334]	No NOAEL chemical exceedances	No chemical exceedances	No LOAEL chemical exceedances
Modeled exposures using field-collected fish	Copper (1.65) Selenium (1.16) LMW PAH (1.99)	Copper [1.41] Selenium [1.32] LMW PAHs [314]	***Copper (1.39)*** Selenium (1.07)	Copper [1.34] Selenium [1.27]	No LOAEL chemical exceedances
AVIAN WILDLIFE: OSPREY					
Modeled exposures using prey uptake from benthic organisms	Lead (1.42) Vanadium (6.13) HMW PAHs (3.12) LMW PAHs (13.3) PCBs (3.94)	Lead [10.6] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [165] PCBs [8.38]	Vanadium (4.19) LMW PAHs (3.79) PCBs (2.14)	Vanadium [1.23] LMW PAHs [48.1] PCBs [4.98]	No LOAEL chemical exceedances
Modeled exposures using field-collected crabs	LMW PAH (2.33)	LMW PAHs [334]	No NOAEL chemical exceedances	No chemical exceedances	No LOAEL chemical exceedances
Modeled exposures field-collected fish	Copper (1.92) Selenium (1.35) LMW PAH (2.33)	Copper [1.41] Selenium [1.32] LMW PAHs [314]	Copper (1.63) Selenium (1.25)	Copper [1.34] Selenium [1.27]	No LOAEL chemical exceedances

Bold and italic- indicates a chemical exceedence after home range area use factor is applied.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

Table ES.3. Summary of Ecological Risk Results for Mammalian Wildlife

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		
	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding Low-Effects Level Benchmark[A]
MAMMALIAN WILDLIFE: RACCOON					
Modeled exposures using prey uptake from benthic organisms	TCDD TEQ (3.69) Aluminum (79.6) Antimony (1.39) Arsenic (2.78) Chromium (1.38) Lead (1.60) Selenium (3.37) Thallium (1.70) Vanadium (1.64) HMW PAHs (55.4) LMW PAHs (2.21) PCBs (255)	TCDD TEQ [2.48] Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Chromium [2.24] Lead [10.6] Selenium [5.07] Thallium [3.49] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [167] PCBs [8.38]	***TCDD TEQ (1.46)*** ***Aluminum (70.3)*** ***Arsenic (1.07)*** Selenium (1.27) ***Vanadium (1.12)*** ***HMW PAHs (13.5)*** ***PCBs (138)***	TCDD TEQ [1.04] Aluminum [1.09] Arsenic [2.58] Vanadium [1.23] HMW PAHs [11.0] PCBs [4.98]	***Aluminum (7.03)*** ***PCBs (14.0)***
Modeled exposures using field-collected crabs	Aluminum (46.8) Arsenic (1.05) Copper (1.88) Selenium (5.42) HMW PAH (2.11) PCBs (16.0)	Aluminum [1.25] Arsenic [1.20] HMW PAHs [40.5]	Aluminum (41.3) Copper (1.41) Selenium (4.88) PCBs (15.1)	Aluminum [1.11]	***Aluminum (4.13)*** ***Selenium (2.12)*** ***PCBs (1.53)***
Modeled exposures field-collected fish	Aluminum (55.6) Antimony (1.15) Copper (4.50) Lead (1.04) Selenium (8.87) Thallium (1.32) HMW PAH (2.02) PCBs (42.3)	Antimony [1.28] Copper [1.41] Lead [7.07] Selenium [1.32] Thallium [10.2] HMW PAHs [42.4] PCBs [1.18]	***Aluminum (49.4)*** ***Copper (3.81)*** ***Selenium (8.22)*** Thallium (1.13) ***PCBs (40.9)***	Copper [1.34] Selenium [1.27] Thallium [8.69] PCBs [1.14]	***Copper (1.38)*** ***Selenium (3.56)*** ***PCBs (4.14)***
MAMMALIAN WILDLIFE: RIVER OTTER					
Modeled exposures using prey uptake from benthos	TCDD TEQ (3.47) Aluminum (74.9) Antimony (1.31) Arsenic (2.62) Chromium (1.30) Lead (1.50) Selenium (3.18) Thallium (1.60) Vanadium (1.55) HMW PAHs (52.1) LMW PAHs (2.08) PCBs (240)	TCDD TEQ [2.48] Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Chromium [2.24] Lead [10.6] Selenium [5.07] Thallium [3.49] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [167] PCBs [8.38]	***TCDD TEQ (1.37)*** ***Aluminum (66.2)*** Arsenic (1.01) Selenium (1.19) Vanadium (1.06) ***HMW PAHs (12.8)*** ***PCBs (130)***	TCDD TEQ [1.04] Aluminum [1.09] Arsenic [2.58] Selenium [1.91] Vanadium [1.23] HMW PAHs [11.0] PCBs [4.98]	***Aluminum (6.62)*** ***PCBs (13.2)***
Modeled exposures using prey uptake from crabs	Aluminum (44.0) Copper (1.77) Selenium (5.10) HMW PAH (1.99) PCBs (15.1)	Aluminum [4.44] Copper [3.28] Selenium [3.53] HMW PAHs [144] PCBs [2.65]	Aluminum (38.9) Copper (1.32) Selenium (4.60) PCBs (14.3)	Aluminum [1.11]	***Aluminum (3.89)*** ***Selenium (1.99)*** ***PCBs (1.44)***
Modeled exposures using prey uptake from fish	Aluminum (52.3) Antimony (1.08) Copper (4.24) Selenium (8.35) Thallium (1.25) HMW PAH (1.90) PCBs (39.8)	Aluminum [3.02] Antimony [4.56] Copper [5.03]Selenium [4.68] Thallium [36.0] HMW PAHs [150] PCBs [4.19]	***Aluminum (46.5)*** ***Copper (3.58)*** ***Selenium (7.74)*** Thallium (1.06) ***PCBs (38.5)***	Copper [1.34] Selenium [1.27] Thallium [8.68] PCBs [1.14]	***Copper (1.30)*** ***Selenium (3.35)*** ***PCBs (3.89)***

Bold and italic- indicates a chemical exceedence after area use factor is applied.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

Taken together, the lines of evidence indicate that the PCBs and PAHs are the chemicals driving risks for the Coke Point Offshore Area. Metals, dioxins, and VOCs are not considered risk drivers because they demonstrate reasonable maximum scenario risks that are either comparable to background risks or below low-effects level benchmarks. PCBs are a site-related COC because both no-effects level benchmark and low-effects level benchmark reasonable maximum scenario risks are above acceptable levels and because risks for exposures to some prey types are greater than those in background. It must be noted however, that exposure pathways based on ingestion of crab produced higher risks for background. HMW PAHs and LMW PAHs were considered to be site-related risk drivers, but with a limited potential for impacts under maximum exposure scenarios only. Impact was considered limited because reasonable maximum scenario doses of PAHs exceed no-effects level benchmarks but not low-effects level benchmarks. HMW PAHs and LMW PAHs were maintained as risk drivers because both tissue concentrations and doses are higher in the Coke Point Offshore Area than in the background area and because screening level scenarios produce low-effects level benchmark exceedences.

The finding of the ERA is that wildlife which consume aquatic and benthic organisms are potentially at risk from chemicals insurface sediment at the Coke Point Offshore Area. The chemicals driving risks are PCBs, HMW PAHs, and LMW PAHs. HMW PAHs and LMW PAHs are also considered to be site-related risk drivers, but with a limited potential for impacts under maximum exposure scenarios only. Metals, dioxins, and VOCs are not considered risk drivers because they demonstrate reasonable maximum scenario exposures that are either comparable to background or below low-effect level benchmarks.

Summary of Ecological Risks

The conclusion of the ecological risk assessment is that specific chemicals in surface sediments of the Coke Point Offshore Areamay pose risks to ecological receptors and that those risks are greater than the background risks posed in the Patapsco River Background Area. A primary contributor to this risk is the accumulation of chemicals from sediment into benthic organisms. Concentrations of PAHs and PCBs in surface sediment are elevated in the offshore area. Therefore, chemicals in surface sediment and benthic tissues are considered the primary risk drivers.PCBs are identified as the chemicals most likely to cause risks. LMW PAHs and HMW PAHs are also identified as risk drivers, but with a limited potential for impacts associated primarily with the areas of highest exposure/highest concentrations.

HUMAN HEALTH RISK ASSESSMENT (HHRA)

The offshore area around the Coke Point Peninsula was evaluated in two separate HHRAs. The Risk Assessment for Public Health Impacts (HHRA-PH) characterized human exposures given the current conditions of the offshore area. Currently, the offshore area around Coke Point is not expected to be frequently used for swimming or other water activities, and it is expected that people would visit other, more easily accessible areas available in close proximity to Coke Point Offshore Area (e.g., state parks, private docks, etc.). However, there are no controls against these activities, so there is a potential for these activities to occur. This exposure scenario took into account exposures modeled in previous RCRA-related investigations and consultation with site-specific USEPA and MDE inputs (ISG 2005 and USEPA/MDE 2011a). The HHRA-PH

provides an estimate of a site-specific exposure that takes into account the mobility of aquatic organisms in the offshore area by evaluating sample results from studies of field-collected crab and fish tissue. The results of the HHRA-PH provide a long-term risk characterization of the people fishing/crabbing in the area under current conditions.

The Risk Assessment for Source Characterization and Site Planning (HHRA-SC) provides an evaluation of human health risks that will aid the MPA with internal decision making for future site planningand determining potential remediation requirements.The HHRA-SC provides a theoretical maximum exposure that provides conservative indication of potential contribution to risk from offshore sediment and surface water.The HHRA-SC focused on exposures limited to the Coke Point Offshore Area and analyzes crab and fish consumption based on site-specific data. The HHRA-SC relied on site-specific bioaccumulation studies to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption.Potential receptor exposure to surface water, sediment, modeled fish tissue, and modeled crab tissue were evaluated. This HHRA evaluated potential risk contributions specifically from the offshore area evaluated without regard to the actual human use of the area.

Potential cumulative risks for both the HHRA-PH and the HHRA-SC were calculated for the adult recreational user, adolescent recreational user, child recreational user, and watermen for exposure to surface water, sediment, and fish and crab concentrations. Both the Coke Point Offshore Area and the Patapsco River Background Areawere evaluated for all receptors and exposures.

For both of the HHRAs, quantitative risk estimates were compared to MDE and USEPA risk thresholds. These comparisons aid in making risk management decisions for the site. For excess carcinogenic risk results, the USEPA defines the range of 10^{-4} to 10^{-6} as a target risk range. Cumulative carcinogenic risks that are below the lower end of the risk range (10^{-6}) typically do not require further action. Cumulative carcinogenic risks within the target range may require risk management decisions; however, cumulative or individual exposure pathway carcinogenic risks above the upper end of the target range (10^{-4}) typically require additional actions or consideration. Additionally, MDE considers cumulative carcinogenic risks greater than 10^{-5} as levels that may require remedial actions.

For non-carcinogenic hazards, MDE and USEPA have identified a target valueof 1 (USEPA 1989). Per input from USEPA, non-carcinogenic values below 1.5 were considered acceptable because they round to 1 (USEPA 2011b). Cumulative non-carcinogenic hazards above this threshold identify potential concerns with chemicals that may affect specific organs or systems (e.g., reproductive system, developmental, etc.) within the body. If cumulative non-carcinogenic hazards exceed the threshold, target organs or systems associated with Chemicals of Potential Concern (COPCs) are identified. If the COPCs affect the same target organ, there may be concern that potential adverse health effects will be observed. In general, the greater the value of the non-carcinogenic hazards above the threshold, the greater the level of concern. However, results above the threshold do not represent a statistical probability that an adverse health effect will occur.

Summary of HHRA-PH Risks

The HHRA-PH evaluated cumulative risks for exposure to surface water, sediment, and field-collected fish and crab tissue. The HHRA-PH evaluatedthe potential exposure people would experience under the current conditions of the Coke Point Offshore Area. The HHRA-PH evaluated the Coke Point Offshore Area for an expected low frequency of use as a recreational area.Results for the HHRA-PH reveal cumulative carcinogenic risk results that are above the USEPA carcinogenic target levels for all receptors, except the child recreational user. Non-carcinogenic hazards exceeded USEPA target levels for only the child recreational user.Dermal exposure to surface water was the primary contributor to cumulative carcinogenic risk results. Consumption of crab and fish also contributed to excess carcinogenic risk results. The carcinogenic results for the consumption of crab and fish were comparable to the results for the Patapsco River Background Area. However, the chemicals that contributed significantly to risk results differed according to the area evaluated. PAHs were the primary contributor to fish tissue in the Coke Point Offshore Area. Total PCBs were the primary contributors to consumption of crab tissue risks for both the Coke Point Offshore Area and the Patapsco River Background Area. It is noted that MDE hasa fish advisory in place for the Patapsco River (including the offshore area of the Coke Point Peninsula) to account for PCBs (MDE 2007). The analysis of uncertainties for the HHRA-PH indicated that the risk due to dermal exposure to surface water was over-estimated due to assumptions inherent in the dermal exposure model (USEPA 2004). Non-carcinogenic hazards are primarily from the consumption of crab tissue. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in surface water were the primary contributors to overall cumulative risks. Dioxins were the primary contributor to non-carcinogenic hazards. It is noted that the risk results for dioxin were based upon exposure modeled using a BAF from the scientific literature and were not a result of field-collected tissue samples. Tables ES.4 and ES.5 summarize the results of the HHRA-PH.

Table ES.4. Risk Assessment for Public Health Impacts
Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$3.4x10^{-7}$	$1.1x10^{-4}$	$8.8x10^{-5}$	$2.9x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.4x10^{-6}$	$1.3x10^{-4}$	$3.7x10^{-5}$	$1.1x10^{-5}$	$1.8x10^{-4}$
Child Recreational User	$7.3x10^{-7}$	$4.9x10^{-5}$	$1.4x10^{-5}$	$4.2x10^{-6}$	$6.8x10^{-5}$
Watermen	$9.6x10^{-6}$	$2.4x10^{-4}$	$1.1x10^{-4}$	$3.6x10^{-5}$	$4.0x10^{-4}$
Patapsco River Background Area					
Adult Recreational User	$2.9x10^{-8}$	$7.1x10^{-6}$	$5.0x10^{-5}$	$4.1x10^{-5}$	$9.8x10^{-5}$
Adolescent Recreational User	$9.9x10^{-8}$	$8.2x10^{-6}$	$1.9x10^{-5}$	$1.6x10^{-5}$	$4.3x10^{-5}$
Child Recreational User	$5.0x10^{-8}$	$3.0x10^{-6}$	$7.2x10^{-6}$	$5.9x10^{-6}$	$1.6x10^{-5}$
Watermen	$8.0x10^{-7}$	$1.5x10^{-5}$	$6.1x10^{-5}$	$5.0x10^{-5}$	$1.3x10^{-4}$

Table ES.5. Risk Assessment for Public Health Impacts
Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.0008	0.0005	1.1	0.1	1.2
Adolescent Recreational User	0.004	0.0006	1.3	0.2	1.4
Child Recreational User	0.006	0.0007	1.6	0.2	1.8
Watermen	0.02	0.0009	1.4	0.2	1.5
Patapsco River Background Area					
Adult Recreational User	0.00009	0.0002	0.4	0.2	0.6
Adolescent Recreational User	0.0004	0.0002	0.4	0.2	0.6
Child Recreational User	0.0007	0.0002	0.5	0.3	0.8
Watermen	0.003	0.0003	0.5	0.2	0.7

Summary of HHRA-SC Risks

The HHRA-SC evaluated cumulative risks for exposure to surface water, sediment, and BAF modeled fish and crab tissue. Fish and crab tissue were modeled from laboratory bioaccumulation tests of Coke Point sediment. These laboratory bioaccumulation tests provided a link between chemical concentrations in sediment and chemical concentrations taken up into tissue. The uptake into tissue is not influenced by the mobility of organisms or variations in field conditions. The HHRA-SC evaluated a theoretical maximum exposure that provides a conservative indication of potential contribution to risk from offshore sediment and surface water. Results for the HHRA-SC revealedcumulative carcinogenic risk results that were above the USEPA carcinogenic target levels for all receptors. Non-carcinogenic hazards also exceeded USEPA target levels for all receptors evaluated. For all receptors, the consumption of modeled crab and fish tissue and dermal exposure to surface water were the primary pathway contributing to carcinogenic and non-carcinogenic risks. As in the HHRA-PH, it is noted that the predicted risks associated with dermal surface water contact were likely over-estimated. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in modeled fish and crab tissue, surface water, and total PCBs in modeled crab tissue were significant contributors. Dioxin and naphthalene were the primary contributor to non-carcinogenic hazards. Table ES.6 and ES.7 summarize the results of the HHRA-SC.

Table ES.6. Risk Assessment for Source Characterization and Site Planning Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$2.7x10^{-6}$	$9.2x10^{-4}$	$1.0x10^{-3}$	$6.1x10^{-4}$	$2.6x10^{-3}$
Adolescent Recreational User	$1.2x10^{-5}$	$1.1x10^{-3}$	$9.7x10^{-4}$	$7.0x10^{-4}$	$2.7x10^{-3}$
Child Recreational User	$5.9x10^{-6}$	$3.9x10^{-4}$	$3.6x10^{-4}$	$2.6x10^{-4}$	$1.0x10^{-3}$
Watermen	$9.6x10^{-6}$	$4.9x10^{-4}$	$1.3x10^{-3}$	$7.4x10^{-4}$	$2.5x10^{-3}$
Patapsco River Background Area					
Adult Recreational User	$3.0x10^{-7}$	$5.8x10^{-5}$	$1.3x10^{-4}$	$4.0x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.1x10^{-6}$	$6.7x10^{-5}$	$9.7x10^{-5}$	$4.5x10^{-5}$	$2.1x10^{-4}$
Child Recreational User	$5.7x10^{-7}$	$2.5x10^{-5}$	$3.6x10^{-5}$	$1.7x10^{-5}$	$7.9x10^{-5}$
Watermen	$1.1x10^{-6}$	$1.5x10^{-5}$	$1.6x10^{-4}$	$4.8x10^{-5}$	$2.2x10^{-4}$

Table ES.7. Risk Assessment for Source Characterization and Site Planning Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.01	0.006	1.7	0.3	2.0
Adolescent Recreational User	0.04	0.006	1.9	0.4	2.4
Child Recreational User	0.07	0.008	2.4	0.5	3.0
Watermen	0.03	0.005	2.0	0.4	2.5
Patapsco River Background Area					
Adult Recreational User	0.003	0.003	0.6	0.3	0.9
Adolescent Recreational User	0.02	0.004	0.7	0.3	1.0
Child Recreational User	0.03	0.004	0.8	0.4	1.3
Watermen	0.01	0.003	0.7	0.4	1.1

The results of the HHRAs indicate that calculated risks for potential human exposure to the Coke Point Offshore Area are above those for the Patapsco River Background Area.

HHRA Conclusions

Surface Water

A primary contributor to cumulative carcinogenic risks in both the HHRA-PH and HHRA-SC was the dermal contact with surface water exposure pathway. The risk results for this pathway present a number of uncertainties that need to be taken into account in risk management decisions. PAHs were the only class of chemicals that contributed to the carcinogenic risks determined for the surface water exposure pathway. The USEPA dermal guidance (USEPA 2004) notes that the permeability coefficients (PCs) estimated for PAHs are outside of a predictive range and cannot be verified. As a result, the actual absorbed dose of PAHs through

the skin was most likely over-estimated. Additionally, the surface water exposure pathway also estimated potential risks for exposure to the entire study area around the Coke Point Peninsula, including water within the turning basin and along the Coke Point shoreline. The use of the USEPA ProUCL program takes into account sample results over the entire exposure area to eliminate some uncertainty and determine the concentration contacted over the entire area, including samples with non-detects. However, actual PAH detections in surface water were spatially limited. **Figures 3.13** through **3.15**in the risk assessment present the detected PAH concentrations, as represented by benzo(a)pyrene. PAHs are highest in surface water locations immediately offshore of Coke Point Peninsula at locations BH-W-06 and BH-W-10B. These locations are not expected to attract recreational swimmers based on current site conditions. Furthermore, surface water PAH detections were not consistently detected throughout the study area which is a result of typical surface water movement and influences from other conditions, including groundwater discharge, tidal flow, etc. Due to these limitations, potential carcinogenic risks for dermal contact with surface water were likely over-estimated. The results of the HHRA should be used in context with the known groundwater contamination discharge to surface water to determine risk management decisions for potential human health concerns and potential project design. The Site Assessment (EA 2009b) noted that impacted groundwater fluxes from the northwestern and eastern parts of the Coke Point Peninsula to the adjacent Patapsco River and Turning Basin. This discharge of groundwater to surface water has negatively affected surface water quality (EA 2009b). Additionally, sediments along the Coke Point shoreline are impacted with residual NAPL and have the potential to be disturbed along the shoreline by wave action (EA 2009b). Both factors could potentiallycontributeto elevated concentrations of PAHs in surface water and act as a continual source.

Sediment

Overall risk results for exposure to sediment were within acceptable levels for both the Coke Point Offshore Area and the Patapsco River Background Area. However, risks for the Coke Point Offshore Area were greater than those for the Patapsco River Background Area. The highest concentrations of PAHs in surface sediment were found along the Coke Point shoreline, but the area of impacted sediments is not confined to one or two localized regions. Elevated concentrations of PAHs and metals were detected in surface sediments all around the Coke Point Peninsula. As noted in **Appendix H**, average concentrations of metals, PAHs, and PCBs were higher in clams exposed to Coke Point sediments compared to concentrations in clams exposed to control sediments and compared to clams prior to testing (pre-test tissues). The same trends were apparent for aquatic worms. This is a strong indication that uptake from sediments into tissue occurs and that at least some portion of the chemicals in sediment is bioavailable to aquatic organisms. Therefore, chemicals within sediment along the Coke Point Offshore area are available for uptake and present a potential continual source of chemicals to fish and potentially humans.

Fish and Crab Tissue

The overall risk results for the consumption of field-collected fish and crab tissue, when evaluated as separate exposures, were acceptable per USEPA guidance. Carcinogenic and non-carcinogenic risk estimates for Coke Point crab consumption were higher than background, but

still acceptable, though only marginally for certain receptors.Concentrations of chemicals in field-collected crab tissue from the Coke Point Offshore Area were statistically significantly higher than those in the background area for a number of chemicals, including metals and some PAHs (**Appendix H**). For field-collected fish tissue, fish filets from the Patapsco River Background Area contained higher overall concentrations of total PCB congeners, arsenic, and selenium than filets from the Coke Point Offshore Area.Bioaccumulation studies, **Appendix H**, provide evidence that chemicals from sediment are taken up into the aquatic food chain at concentrations higher than those in background. Therefore, chemicals within the Coke Point Offshore Area are available for uptake and present a potential continual source of chemicals to fish and potentially humans.

UNCERTAINTIES

Risk assessments involve a number of uncertaintiesthat must be taken into consideration when interpreting risk assessment results. The risk assessment for the Coke Point Offshore Area bears a number of uncertainties. The risk assessment was based on existing conditions, and did not evaluate hypothetical future scenarios that could arise should erosion or dredging expose deeper sediments with different exposure concentrations. Risk assessment methods as specified by guidance (USEPA 1997a, 2002) are precautionary; as such, they are protective but may over-estimate risks to assure protectiveness of public health and the environment. The chemical analytical data set used for the risk assessment was subject to limitations associated with environmental variability. In particular, surface water concentrations can be highly variable due to changing sources. There is also uncertainty associated with extrapolation from modeled effects to individuals to community level effects for ecological receptors. Use of site-specific tissue data to characterize bioaccumulation decreased the uncertainty of the risk assessment overall, but introduced some uncertainty associated with field-collection of fish and crabs (i.e., a single sampling event; a single fish species, etc.). Methods of mitigating uncertainty were incorporated into the risk assessment approach to the greatest extent possible. It is not possible to quantify the degree of uncertainty within the risk assessment. However, a relative comparison of the risk assessment results to reduced risksas a result of potential project design can be performed subsequent to this study.

CONCLUSIONS AND RECOMMENDATIONS

The results of the risk assessment support the following conclusions:

- **Ecological Risks:** Specific chemicals in sediments of the Coke Point Offshore Area may pose risks to ecological receptors that are greater than the background risks posed in the Patapsco River Background Area.
    - Arsenic, chromium, copper, lead, mercury, zinc, LMW PAHs, HMW PAHs, dioxins, and total PCBs in surface sediment pose predicted risks to aquatic organisms such as clams, worms, and crustaceans. Several of the same chemicals were found in surface water and also contribute risks.
    - Total PCBs pose risks to wildlifesuch as birds and mammals that are higher than background for some prey types; LMW PAHs and HMW PAHs may pose risks

for wildlife, but their potential for impacts is limited to those portions of the site with the highest concentrations.

- Risks to wildlife are due to both incidental ingestion of sediment and ingestion of bottom-dwelling organisms such as clams and worms that have accumulated chemicals in their tissue. Highest risks to wildlife are driven by ingestion of sediment and benthic orgamisms (as opposed to surface water, crabs, and fish).

- **Human Health Risks:**Specific chemicals in sediments and surface water of the Coke Point Offshore Area pose potential risks to human receptors that are greater than the risks posed in the Patapsco River Background Area.

  - For both HHRAs, carcinogenic risks are primarily driven by total PCBs and the PAHs benzo(a)pyrene and dibenz(a,h)anthracene.

  - BothHHRAs predicted that a primaryexposure pathway that contributes to risks above acceptable levels and greater than the Patapsco River Background is dermal exposure to surface water during swimming, commercial fishing, or other water activities. While the numeric estimate of this risk is probably over-estimated, the indicator that risk associated with the Coke Point Offshore Area is higher than the Patapsco River Background Area is relevant.

  - Both HHRAs predicted risk for surface sediment that is within levels generally considered acceptable, although risks are elevated at levels higher than the Patapsco River Background Area.

  - The HHRA-PH risk results for field-collected crab and fish tissue were comparable between the Coke Point Offshore Area and the Patapsco River Background Area. When evaluated as separate exposure pathways, risks were considered acceptable in accordance with USEPA guidance, although risks from crab consumption are at the upper limit of the risk range typically considered acceptable. Risks were attributable to total PCBs for both areas and PAHs for the Coke Point Offshore Area. It is noted that MDE has issued a fish advisory for the Patapsco River to account for total PCBs (MDE 2007).

  - The HHRA-SC risk results reveal that long-term consumption of fish and crab, based upon results of laboratory bioaccumulation tests and uptake modeling, are above levels generally considered acceptable. Risk results for the Coke Point Offshore Area are also elevated above the Patapsco River Background Area.

  - The HHRA-SC reveals that the Coke Point Offshore Area contributes risks through the local food chain due to uptake by aquatic organisms such as clams and worms. Basing exposures on tissue concentrations from lower trophic level organisms, such as clams and worms produced higher risks than basing exposures on concentrations from field-collected fish and crab which are higher on the food chain. However, chemical contributions from Coke Point were still evident in tissue concentrations from crabs and fish.

A recommendation of the risk assessment is that the MPA project team incorporates the finding of potential risks from sediment into DMCF project planning, as this may be relevant to how the DMCF and associated features may be designed. It is therefore recommended that risk reduction be considered as means for informing potential project design. The risk assessment provides models and tools that could be used to formulate design options and predict their effective risk reduction.

Future risk reduction efforts should focus on chemicals identified as primary risk drivers in surface sediment and surface water. Risk reduction efforts for these chemicals would also address elevated concentrations of other chemicals that also contribute to overall, cumulative risks and are co-located in the same area. The primary focus of the offshore risk reduction should target the highest concentrations of chemicals identified as primary risk drivers, located in surface sediments to the west and southeast of Coke Point. Subsurface sediment was not evaluated in the risk assessment. Exposure pathways for subsurface sediment were considered incomplete in this evaluation of current conditions. As a result, potential future risk as a result of erosion or dredging has not been considered in the risk assessment. Risk reduction efforts should take into account subsurface sediments if current conditions within the Coke Point Offshore Area are expected to change; additional evaluation of subsurface sediment may be required as part of the MPA's site planning for a DMCF.

To address these recommendations, MPA should complete a risk management study to evaluate the extent to which offshore and onshore remedial measures implemented in conjunction with proposed DMCF would lead to overall risk reduction. Information from the risk assessment and risk management study will assist MPA in determining whether a DMCF at Coke Point could be part of a clean-up effort for the site.

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1. INTRODUCTION

The Sparrows Point Steel Mill Facility is located on approximately 2,300 acres on the north side of the Patapsco River in Baltimore County, Maryland, approximately 9 miles southeast of downtown Baltimore (**Figure 1.1**). The Maryland Port Administration (MPA) has expressed an interest in acquiring the Coke Point Peninsula (Coke Point) on the Sparrows Point property as a potential site for a Dredged Material Containment Facility (DMCF) for placement of dredged material from channels in the Baltimore Harbor.

Sediment dredged from the Patapsco River west of the North Point-Rock Point line (**Figure 1.1**) is statutorily prohibited by the State of Maryland from being re-deposited in an unconfined manner into or onto any portion of the Chesapeake Bay waters or its tributaries. With only two existing placement sites currently available (the Cox Creek DMCF and the Masonville DMCF), an impending dredged material placement capacity shortfall has resulted in an ongoing need to study, select, and develop new sites capable of accepting dredged material from within Baltimore Harbor. A group of community members, citizens groups, and state, Federal, and local government representatives, referred to as the Harbor Team, was tasked by MPA with identifying possible locations for placement of dredged material. After an extensive screening process by the Harbor Team, MPA identified the Coke Point Peninsula as one of the potential sites for construction of a DMCF.

The Coke Point Peninsula is part of a site regulated under the Resource Conservation and Recovery Act (RCRA). MPA conducted a Site Assessment of Coke Point to evaluate the nature and extent of onshore chemical sources and assess potential impacts to offshore sediment and surface water in concert with due diligence activities for the potential purchase of the site for use as a DMCF. This Site Assessment included investigation of contaminants in sediment and surface water offshore from the Coke Point Peninsula [EA Engineering, Science, and Technology, Inc. (EA) 2009b]. The Site Assessment found that sediment quality is adversely affected adjacent to most of Coke Point shoreline, and concentrations of polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and metals are elevated above background levels. In addition, groundwater fluxes from northwestern and eastern parts of Coke Point to the adjacent Patapsco River and Turning Basin have negatively affected sediment and surface water quality. An additional study was performed to determine whether metals, PAHs, and polychlorinated biphenyls (PCBs) from the Coke Point Offshore Area are taken up into fish, crabs, and other aquatic organisms through bioaccumulation; this study found evidence that these chemicals are accumulated in tissue at higher concentrations in the Coke Point Offshore Area than in nearby background areas within the Patapsco River evaluated in the Site Assessment (**Appendix H**).

MPA has requested a risk assessment of the offshore environment to assess whether the observed impacts to sediment and surface water present potential risk levels above those typically considered acceptable by Maryland Department of the Environment (MDE) and U.S. Environmental Protection Agency (USEPA). The results of the risk assessment in combination with other conditions (i.e., contaminated groundwater discharge to the Patapsco River) may be used to determine the need for d in the offshore environment. This risk assessment of the area

offshore of the Coke Point Peninsula quantifies the risks to both ecological populations and people who would have access to the offshore area under existing conditions. The risk assessment does not take into account potential risk that may occur as a result of erosion or dredging near the Coke Point Peninsula. If a property transfer occurs, this risk assessment will provide information for the planning and design of potential remedial measures that would accompany DMCF development. The results of this risk assessment will be integrated into the the Feasibility Study (FS) for the proposed DMCF construction at the Coke Point Peninsula.

1.1 PROJECT SCOPE AND PURPOSE

The general scope for the risk assessment is set forth in the document *Work Plan for Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point* (EA 2010b). Both the work plan and a draft of the risk assessment were submitted to Maryland Environmental Service (MES), MPA, USEPA, and MDE; for review, agency comments on the draft final risk assessment are provided in Appendix I. This risk assessment follows the general methodology set forth in USEPA guidance for conducting ecological and human health risk assessments (USEPA 1989, 1991, 1997a). The risk assessment focuses on potential exposure scenarios for biota and humans to chemicals in sediment and surface water offshore of Coke Point under existing conditions (referred to as the Coke Point Offshore Area). It is important to note that the assessment focuses on surface sediment (0 to 1 foot [ft] in depth) and surface water, and does not evaluate exposures to deeper (subsurface/below 1 ft in depth) sediments since these deeper sediments are less likely to be contacted under existing conditions. The assessment focuses specifically on chemicals that may have originated from potential sources on the Coke Point Peninsula, as indicated by previous studies. These chemicals include metals, organotins, PAHs, PCBs, dioxins, furans, and VOCs. For purposes of the risk assessment, the area of potential exposure is defined as the area within the potential outer edge of the impacted sediments that have been investigated as part of previous studies (**Figure 1.2**) (EA 2009a, 2009b, 2010a). This area is primarily bounded by the navigational channels that are maintained around the Coke Point Peninsula, including the Brewerton Channel, Coal Pier Channel, and the Turning Basin Channel. This boundary provides the most current definition of the extent of chemical influence from the Coke Point Peninsula and comprises approximately 500 acres.

The general approach of the assessment is designed to address three major purposes. The first purpose is to quantify existing potential risks in the Coke Point Offshore Area caused by chemicals originating from sources on the Coke Point Peninsula. The risk assessment uses exposure models and toxicological benchmarks to establish whether there is a potential for risks above acceptable levels as identified by MDE andUSEPA. For each ecological or human exposure scenario, the assessment provides a characterization of risks based on the available evidence; this is called a weight-of-evidence approach. Per USEPA guidance, the characterization of risks is designed to be precautionary. This means that the basic assumptions and metrics used in the assessment err on the side of protectiveness when there is uncertainty, and that the assessment is more likely to overestimate risks rather than underestimate risks.

A second purpose of the assessment is to aid in quantifying potential risk reduction. The Patapsco River receives sediment and surface water inputs from a variety of sources including, but not limited to, Coke Point. Therefore, the risk estimates provided by exposure models and toxicological benchmarks include some contribution of chemical sources not related to Coke Point. When quantifying risk reduction, it is important to differentiate the risk produced by these sources, which may include urban runoff, legacy pollution, or pollution deposited from the air. Therefore, the risk assessment includes a comparison of the risk estimates for chemicals in the Coke Point Offshore Area to risk estimates based on chemical concentrations measured in sediments and water of the Patapsco River that are beyond the immediate influence of Coke Point (referred to as the Patapsco River Background Area). This comparison is presented as part of the weight of evidence evaluation for each exposure scenario. In addition, the assessment includes a qualitative discussion of results from other studies in the Patapsco River that provide background data. It is important to note that the purpose of this risk assessment is to quantitatively evaluate potential risks from exposure to the offshore areas adjacent to the Coke Point Peninsula. Consequently risk results based on nearby samples in the Patapsco River are included as comparison values to provide context, and are not intended as a comprehensive characterization of risks across the full reach of the Patapsco River.

A third purpose of the risk assessment is to provide information and recommendations that can be used in development of the design of the DMCF. The risk assessment provides conclusions that detail the specific chemicals of concern (COCs) for the Coke Point Offshore Area, their potential for risk and relative risk compared to background, and maps that display the magnitude of detected concentrations of COCs.

1.2 SPECIFIC OBJECTIVES OF THE RISK ASSESSMENT

The objective of this risk assessment is to provide a characterization of human health and ecological risks in the offshore environments around the Coke Point Peninsula resulting from chemicals expected to originate from Coke Point sources. The risk assessment quantifies baseline risks under existing conditions at the Coke Point Offshore Area. The risk assessment does not take into account potential future risk that may occur as a result of erosion or dredging near the Coke Point Peninsula. It is important to note that the site investigations and risk assessment are limited to the Coke Point area and are not intended to provide a comprehensive assessment of the entire Sparrows Point Facility. Rather, the primary objective of this assessment is to identify potential risks to aid in determining the extent to which features which reduce risks are needed for the purpose of DMCF site planning and design. Identification of existing Coke Point-related risk will assist with assessment of property value, performance of due diligence related to environmental liability, remedial risk reduction (with DMCF use), and cleanup costing and design.

The Coke Point Peninsula is part of a site regulated under RCRA, and several chemical sources have been identified for the offshore area (EA 2009b). Results of the Site Assessment (EA 2009b) indicated that the elevated concentrations of PAHs, VOCs, and metals observed in the offshore environments (specifically surface water and sediments) are most likely associated with sources related to Coke Point Peninsula. The construction of the proposed DMCF would provide additional dredged material capacity for sediments from the Baltimore Harbor navigation

channels. A risk assessment is necessary to identify any unacceptable site-related risks or remediation needs associated with the chemicals in the offshore environment to ensure a clear understanding of regulatory context and potential remediation requirements. To meet the need for regulatory context, the risk assessment was conducted using methods standard to guidance for hazardous waste sites. Under this guidance, risk assessment begins with a baseline calculation of potential risks using reasonable maximum scenarios and assumptions that will assure protectiveness; such baseline risk assessments are precautionary and in most cases may over-estimate rather than under-estimate risks. Worm and clam data from laboratory bioaccumulation studies and field-collected, site-specific fish and crab data were used to refine the risk calculations and reduce some of the uncertainty associated with the risk assessment scenarios and assumptions.

Another objective of the risk assessment is to provide information needed to evaluate potential alternative alignments for the DMCF. The results of the risk assessment will support an evaluation of risk reduction that could be achieved through potential remedial measures. By evaluating potential ecological and human health risks from Coke Point Peninsula-related chemicals in offshore environments under existing conditions, the risk assessment provides a standard for comparison against conditions that would be expected if remedial measures were put in place and a DMCF were constructed. As discussed above, the proposed DMCF and associated design features would be expected to result in a beneficial reduction of source-related risks. Design of the DMCF could be influenced by risk assessment results in the evaluation of remedial alternatives for the offshore areas in the CMS. Potential remedial alternatives include (but are not necessarily limited to) sediment capping, remedial dredging, and extending the DMCF offshore by in-water dike construction. An appropriately designed DMCF could cover sediments containing chemicals originating from the site. If the DMCF cannot be extended into the offshore area due to design or regulatory constraints, the risk assessment results will facilitate decisions regarding other offshore alternatives. Therefore, it is essential to conduct a risk assessment to quantify baseline risks as part of evaluating potential overall risk reduction.

Risk assessments can be performed using different methods and approaches. The specific approach or method selected is based in part on the purpose of the assessment. To meet the need to identify potential risk reduction and aid in planning, the assessment uses chemical concentrations in sediment, surface water, fish, crab, and benthic organism tissue to calculate risks to people and biota. Mathematical models are used to estimate the amount of each chemical with which people or biota may come in contact, and information on chemical toxicity is used to determine if these amounts could produce harm. Models involve uncertainty because they use assumptions; as discussed above, assumptions were made that would over-estimate rather than under-estimate risks to ensure protectiveness. There are other methods of risk assessment that attempt to measure impacts without using exposure models; these include epidemiological studies and ecological community surveys. However, each of these methods involves inherent uncertainty, and makes it difficult to attribute risk to specific chemical sources. Use of models with chemical concentrations allows the assignment of risks to specific chemical sources and potentially impacted locations. This is important information for determining potential risk reduction and for planning potential project design.

To accomplish the various objectives of the risk assessment, two separate human health risk assessments (HHRA) are evaluated. The Risk Assessment for Public Health Impacts (HHRA-PH) (Section 5) evaluates the Coke Point Offshore Area based upon current, offshore conditions. Currently, the offshore area around Coke Point is not expected to be frequently used or utilized for swimming or other water activities, and it is expected that people would visit other, more easily accessible areas available in close proximity to Coke Point Offshore Area (e.g., state parks, private docks, etc.). However, there are no controls against these activities, so there is a potential for these activities. The HHRA evaluates human exposures that provide an estimate of a site-specific exposure that takes into account mobility of aquatic organisms in the offshore area. Results from studies of crab and fish tissue collected near Coke Point and standard consumption and exposure rates are taken into account. Human exposures are modeled based upon the Sparrows Point RCRA Corrective Action Documentation of Environmental Indicator Determination (ISG 2005) and USEPA and MDE guidance (USEPA/MDE 2011a). The Risk Assessment for Source Characterization and Site Planning (HHRA-SC) (Section 6) evaluates the Coke Point Offshore Area to aid the MPA with internal decision making for future site planning. The HHRA-SC evaluates a more conservative site use assumption and provides a theoretical maximum exposure that provides a conservative indication of potential contribution from offshore sediment and surface water. The HHRA-SC relies on site-specific bioaccumulation studies rather than field collected fish and crab to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption.

1.3 SITE HISTORY

The Sparrows Point Steel Mill Facility has a long history of steelmaking activities. Pennsylvania Steel built the first furnace at Sparrows Point in 1887. Bethlehem Steel Corporation purchased the facility in 1916 and enlarged it by building mills to produce hot rolled sheet, cold rolled sheet, galvanized sheet tin mill products, and steel plate. During peak steel production in 1959, the facility operated 12 coke-oven batteries, 10 blast furnaces, and 4 open-hearth furnaces. Coke production facilities were first built on Coke Point in about 1903, expanded through the 1930s and 1950s, and operated until 1991 [Rust Environmental & Infrastructure (RE&I 1998)]. Coke is carbonized coal, which is produced as a fuel for use in steel production by baking coal in a heated oven. While awaiting sale, coal tar, a primary byproduct of coking operations, was contained in the Coal Tar Storage Area along the east coast of Coke Point (**Figure 1.2**). The gas stream from the coking ovens contained VOCs, including benzene, toluene, xylenes, and diphenyl, which were removed from the gas using absorbing oil. The VOCs were extracted from the oil and then distilled for sale in the Benzol Processing Area (**Figure 1.2**). Organic compounds associated with these byproducts of the coking process, in particular benzene and naphthalene, have been identified in previous reports as the primary constituents of concern in groundwater on Coke Point (CH2MHill 2001). Coking operations ceased in 1991, and the coke batteries have been torn down. The Sparrows Point Steel Mill Facility is still an active steelmaking operation.

USEPA is the lead regulatory agency for the active enforcement of RCRA requirements at the Sparrows Point Steel Mill Facility. A Consent Decree for the assessment and clean-up of the Sparrows Point Steel Mill Facility was issued by USEPA and MDE in 1997. The Consent Decree provided a synopsis of activities and conditions of concern at Sparrows Point, outlined

corrective measures, and included requirements for interim measures, a Site Wide Investigation (SWI) (URS 2005a), and a Corrective Measures Study which has not yet been conducted (USA et al. 1997). In addition, the Consent Decree mandated a comprehensive evaluation of the potential for both current and future risks to human health and the environment from current and past releases of hazardous waste and hazardous constituents at the facility.

1.4 OFFSHORE CHARACTERIZATION RESULTS

Previous studies at the Sparrows Point Steel Mill Facility focused on documenting existing conditions and characterizing the subsurface hydrogeology and groundwater impacts within five special study areas as defined in the Consent Decree. The Description of Existing conditions (RE&I 1998) reviewed the potential sources of impacts and proposed a detailed framework for future investigations. Follow-up SWI reports focused on characterizing the nature and extent of groundwater impacts within these study areas [CH2MHill 2001, 2002; URS Corporation (URS) 2005a, 2005b, 2006]. A Site Assessment prepared for MPA delineated the sources of chemicals at Coke Point and evaluated the lateral and vertical extent of the transport of chemicals to the offshore environments (EA 2009b).

Most of the Coke Point Peninsula consists of slag fill material approximately 30 feet (ft) thick. Slag is a mixture of metal and rock produced as a by-product of steel making when metal ore is melted. The underlying native geological formations include the Talbot Formation (primarily soft marine silt and sand with bivalve shells) that is underlain by the Patapsco Formation (generally sand and gravel with lenses of sandy clay). The Talbot Formation in the area ranges in thickness from 5 to 100 ft, and the Patapsco Formation ranges from 145 to 255 ft in thickness (RE&I 1998).

Unconfined groundwater exists within a shallow aquifer composed of the slag fill material, and intermediate and deep aquifers exist within the Talbot and Patapsco formations (URS 2005a, 2005b). The three aquifers are hydraulically interconnected, but are partially separated in areas by discontinuous lenses of silt and clay. Groundwater flow direction in the shallow aquifer is radially away from the north-central portion of Coke Point toward adjacent shoreline areas (**Figure 1.2**). More specifically, radial flow on the western side of Coke Point, in the Benzol Processing Area, is toward the Patapsco River to the west. Flow on the south side of Coke Point is south toward the southern shoreline. Flow on the east side of Coke Point, in the Coal Tar Storage Area, is toward the Turning Basin to the east. Groundwater flow direction within the intermediate aquifer along the western portion of Coke Point is northwestward, apparently influenced by historic pumping activities in the area of the Graving Dock (URS 2005a, 2006). Groundwater flow direction within the intermediate aquifer along the eastern portion of Coke Point is south-southwest in the apparent direction of the natural gradient. Groundwater flow direction within the deep aquifer is unidirectional to the east-northeast.

Observed groundwater impacts resulting from historic releases on the Coke Point Peninsula are limited to the shallow and intermediate aquifers. Impacts to shallow groundwater include dissolved mono aromatic hydrocarbons (MAHs), in particular benzene and toluene, emanating from the Benzol Processing Area that migrate in a westerly and northwesterly direction toward the Patapsco River and the Graving Dock Area (URS 2005a, 2006). Impacts to shallow

groundwater also include dissolved PAHs, primarily naphthalene, emanating from the Coal Tar Storage Area that has migrated in an easterly direction toward the Turning Basin (URS 2005a, 2006). High concentrations of benzene (Suthersan 1997) occur within the intermediate aquifer of the site region referred to as the Graving Dock Area (**Figure 1.2**), presumably because historic pumping activities beneath the Graving Dock pulled the shallow groundwater benzene plume downward and northwestward (URS 2005a, 2006).

Recent field investigations by MPA (EA 2009a, 2009b, 2010c) further delineated the sources [i.e., non-aqueous phase liquid (NAPL) and impacted slag fill material] of the previously observed subsurface impacts in the Benzol Processing, Graving Dock, and Coal Tar Storage Areas, and assessed the effects of the sources on surface water and sediment quality in the Patapsco River and the turning basin adjacent to Coke Point. Results of the offshore investigation revealed dissolved MAHs and PAHs in surface water off the northwestern and eastern parts of Coke Point (EA 2009a, 2009b). Based on modeling, the occurrence of these offshore dissolved constituents appeared to be related to impacted groundwater entering near-shore waters from the identified onshore source areas. Offshore sediment also had elevated PAHs and metals. PAH fingerprinting, a forensic sampling and analysis method used to link weathered contaminants and their by-products to their source, suggested that the sediment impacts are related to release(s) resulting from industrial practices at Coke Point (EA 2009b). As a result, surface water and sediment are potential media of concern for offshore receptors.

The most recent field investigations (**Appendix H**) involved collection of fish, crab, and sediments from the Coke Point and Sollers Point (Patapsco River background) areas. The fish and crab tissues were analyzed for metals, PAHs, and PCBs. Composited sediment was analyzed for these chemicals and was utilized by EA's ecotoxicology laboratory to perform bioaccumulation studies with clams and worms. After a 28-day exposure period, clam and worm tissue were also analyzed for metals, PAHs, and PCBs. The laboratory bioaccumulation tests performed as part of this study provide evidence that metals, PAHs, and PCBs in Coke Point sediments are available for uptake. Statistical comparisons indicate that metals, PAHs, and PCBs are bioaccumulated in greater amounts from Coke Point sediments than from sediments in a nearby background area in the Patapsco River. This indicates that the Coke Point Offshore Area causes a higher level of exposure than surrounding areas and contributes these chemicals to the local food chain. Study results indicated that more chemicals were detected at higher concentrations in lower trophic level organisms than in crabs and fish, and that higher concentrations were detected in crabs and whole body fish than in fish filets. This bioaccumulation study provides sediment bioaccumulation factors (BAFs) for use in estimating benthic organism uptake from sediments, and exposure point concentrations (EPCs) as estimates of crab and fish tissue concentrations. Metals accumulated in laboratory bioaccumulation test tissue (clam and worm) at wet weight concentrations no more than 10 percent of the sediment dry weight concentrations. PAHs and PCBs accumulated to wet weight tissue concentrations between 10 and 35 percent of dry weight sediment concentrations.

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2. CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) has been developed for the offshore area around the Coke Point Peninsula. This CSM examines the potential chemical sources, chemical fate and transport mechanisms, exposure routes, and potential receptors for the offshore area to identify complete exposure pathways that require assessment. These exposure pathways link receptors (i.e. aquatic biota, wildlife and humans) to the elevated chemical concentrations observed in the offshore environment.

This CSM for the Coke Point Peninsula offshore area identifies:

- the potential sources and release mechanisms for chemicals with elevated concentrations,
- the fate and transport of these chemicals,
- the media of concern at the offshore area,
- potential pathways to ecological and human receptors, and
- potential wildlife receptors and human populations that could be exposed.

Exposure pathways that are complete and significant for the offshore area are included in the risk assessment. An exposure pathway describes the mechanism by which a potential receptor contacts chemicals present at a site. A complete exposure pathway requires the following four components:

- a source and mechanism of chemical release to the environment,
- an environmental transport medium for the released chemical,
- a point of potential contact with a medium containing chemicals, and
- an exposure route (e.g., ingestion or dermal absorption) at the point of exposure.

All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual exposure of receptors and are not quantitatively evaluated in the risk assessment. The exposure pathways for the ecological and human health components of the risk assessment are summarized in **Figures 2.1** and **2.2**, respectively.

2.1 CHEMICAL SOURCES AND RELEASE MECHANISMS

Potential sources of chemicals that have affected the offshore environments adjacent to the Coke Point Peninsula include the facilities, equipment, resale products, and waste associated with the steel-making process, as well as impacted landside media (slag, soil, and groundwater). The sources are:

- Groundwater plumes – Two groundwater plumes containing elevated concentrations of VOCs and PAHs were shown to be migrating into surface water (URS 2005a, 2006; EA 2009b). One plume is associated with the Benzol Processing Area on the west side of the

site, and one is associated with the Coal Tar Storage Area on the east side. Generally, the plume on the west side of the site contributes benzene; the plume on the east side contributes naphthalene.

- Slag and coal tar – The Coke Point Peninsula consists of an approximately 30-ft layer of slag from steel-making operations (EA 2009b). This slag acts as a potential source of metals, such as lead and zinc. The slag also may be associated with the products of combustion of hydrocarbons, which would include PAHs. Slag could also contain dioxins if PCBs or other chlorinated organic compounds were combusted.
- Graving Dock Area operations – Organotin compounds were used as anti-fouling compounds on ship hulls, and historical ship construction and repair operations may have contributed organotins to sediments in the Graving Dock Area.
- Hydraulic equipment and transformers – The 1999 RCRA Environmental Indicators Determination for the site indicates that PCBs are a constituent of interest for the Sparrows Point Steel Mill Facility (USEPA 1999a). While this determination indicates that they are unlikely to have been released offshore, PCBs were identified in offshore sediment sampling in a pattern consistent with a landside source, which has yet to be determined (EA 2009a, 2010c).

2.2 CHEMICAL TRANSPORT

Fate and transport pathways describe the transfer of elevated concentrations of chemicals between environmental media and between different portions of the site (**Figures 2.1** and **2.2**).

There are several important pathways by which chemicals may enter surface water. Chemicals in groundwater may be transported to surface water at seeps. Elevated chemical concentrations in groundwater are currently migrating into surface water on the west and east sides of Coke Point (EA 2009b). These chemicals may become bound in sediments or may remain dissolved and enter the water column. Chemicals may also be transported into surface water from sediment. Sediment may become suspended in surface water, and chemicals bound to sediment may become dissolved in water dependent on groundwater chemistry.

Chemicals in slag or soil may be transported by erosion, leaching, runoff, and adsorption/desorption. Slag onshore may be eroded and transported directly into the offshore environment. Similarly, erosion and deposition may carry sediment containing chemicals farther away from the site. Metals and other chemicals in slag may be dissolved in water during precipitation events. These may be leached downward into groundwater or may dissolve in surface runoff. Slag that is already submerged offshore forms part of the sediment. Depending on environmental conditions, chemicals in sediment may dissolve/desorb into the water column; alternatively, the sediment may adsorb chemicals from the water column.

Chemicals such as PCBs, dioxins, and organotins are hydrophobic and tend to bind to sediments; they do not tend to become dissolved in the water column. Chemicals such as VOCs and PAHs demonstrate variable dissolution, which depends on their overall concentration in the water column. Metals vary in their solubility based on pH, concentration, and the presence of oxygen. Reducing conditions in brackish, permanently submerged sediments tend to produce forms of

most cationic metals (i.e., copper, lead, nickel, zinc) that remain bound in sediment, but these same reducing conditions may favor solubilization of select metals (e.g., arsenic).

Chemicals could become airborne by vaporization from surface water. Given the concentrations of volatile chemicals previously observed in surface water, this is expected to be a relatively insignificant pathway. Another pathway is historic deposition of combustion product chemicals from the air.

Bioaccumulation is also a relevant transport pathway. Plants and animals that come in contact with elevated concentrations of chemicals in sediment or water may uptake chemicals, and depending on the chemical and the organism, these chemicals may accumulate in tissue. Several metals (e.g., arsenic and lead), PCBs, and dioxins are known bioaccumulators. PAHs may bioaccumulate in crustaceans and other benthic organisms.

2.3 MEDIA OF CONCERN

Based upon chemical sources and release mechanisms, potential media of concern for this risk assessment are sediments and surface water near the Coke Point Peninsula within the Patapsco River and the Turning Basin. As discussed above, chemicals in groundwater may be transported to sediment and surface water at seeps. Chemicals in soil may affect surface sediment and surface water through erosion and runoff from the Coke Point Peninsula to the Patapsco River. For surface water, the full extent of the water column is considered to be the exposure medium. Surface media are the primary concern because these are the media fish, wildlife, and other receptors are most likely to contact. Subsurface sediments (sediments deeper than 1 ft in depth) are unlikely to provide a significant route of exposure to ecological or human receptors; therefore, exposure pathways for subsurface sediments are not considered complete. The risk assessment does not evaluate future hypothetical risks that could occur if site conditions change; such changes would include redistribution of chemical concentrations in the sediment profile due to erosion or mixing. Concentrations of some chemicals are higher in the subsurface than at the surface; the fact that subsurface sediments could be exposed in the future is an uncertainty discussed further in Sections 4.3, 5.6, and 6.6.

Results of previous studies confirm that surface sediment and surface water have been affected by chemicals from the site (EA 2009b). Previous sampling has found dissolved VOCs and PAHs in surface water connected to onshore source areas. Offshore sediment also had elevated PAHs and metals. PAH fingerprinting suggested that the sediment impacts are related to release(s) resulting from industrial practices at Coke Point (EA 2009b). Groundwater connections to surface water still exist, and slag from past activities is still present in onshore and offshore environments. As a result, there is a continual mechanism for the release of chemicals to the offshore surface water and surface sediments.

2.4 ECOLOGICAL RISK – EXPOSURE PATHWAYS AND RECEPTORS

The conceptual site model for the ERA is based on an examination of site ecology. Based on the habitats and species expected offshore, complete pathways, assessment endpoints, and representative receptor species are selected for evaluation in the risk assessment.

2.4.1 Site Ecology

The Coke Point Peninsula is surrounded by the Patapsco River to the west and south, and the Turning Basin to the east. The water bodies around Coke Point are typically well mixed mesohaline aquatic environments in which chemical transport is affected by tidal flow and surface water input from storm events (EA 2009b). Water depths adjacent to the Coke Point Peninsula are typically 2.5 to 6 ft near the shoreline, and drop off to deeper than 10 to 15 ft within 100 ft of the shoreline (GBA 2005). Sediments are predominantly silty clay (EA 2003, 2009a, 2009b), with a substantial occurrence of slag close to the shoreline. Water quality in the Patapsco River is often poor because of eutrophication, and anoxic bottom water conditions have been measured in the vicinity of the Coke Point Peninsula (EA 2003)

A reconnaissance study (EA 2003) characterized shoreline habitats along the Coke Point Peninsula. Most of the upland areas around the Coke Point Peninsula provide little or no habitat. Vegetation along the shoreline is sparse and comprised primarily of invasive and/or exotic species. Birds, including herons, cormorants, terns, gulls, and ospreys, utilize offshore areas, including the shoreline and/or open water, and a cove on the western shoreline provides some deciduous cover near which ospreys have nested. No evidence of mammals or rare, threatened, or endangered species was observed during the reconnaissance study. **Table 2.1** provides a list of threatened or endangered species that could potentially be present offshore, however, no rare species were identified as potentially present [Federal Energy Regulatory Commission (FERC) 2008].

The offshore environment adjacent to the Coke Point Peninsula was also characterized in the reconnaissance study through fisheries studies, benthic community surveys, and review of submerged aquatic vegetation (SAV) maps (EA 2003). White perch and Atlantic silversides dominated fish surveys, although other fish species and blue crabs were collected. Benthic community survey results were evaluated using the Benthic Index of Biotic Integrity. The evaluation found that two survey locations south of Coke Point were marginally degraded, while two survey locations west and east of Coke Point within the offshore area met restoration goals. SAV maps of the area showed no stands of SAV for the years preceding the study (EA 2003). Wetland plants and SAV were not identified as abundant at the offshore area (EA 2003), but phytoplankton was found in the water column (EA 2004).

2.4.2 Assessment Endpoints

Assessment endpoints are clear statements of an environmental value to be protected from impacts (USEPA 1997a). Assessment endpoints are usually defined in terms of an ecological entity and its attributes. The selection of assessment endpoints is based on the fundamental knowledge of site ecology, and incorporates consideration of the COPCs, exposure pathways, toxic mechanisms, and potentially important exposure groups. Per USEPA guidance (USEPA 1997a), the focus of the ERA is to protect the ecological values at the site-wide population or community level except where threatened or endangered species are concerned.

The following preliminary assessment endpoints were defined to reflect the potential impacts of complete and significant exposure pathways and to aid in selecting representative receptor species:

- Viability of aquatic and benthic organism communities, and
- Viability of wildlife communities including piscivorous (fish-eating) birds and mammals.

Given the poor shoreline habitat, water depth, and poor water quality, the current offshore environment around the Coke Point Peninsula is considered unlikely to support SAV or wetland plants. Therefore, viability of wetland plants/SAV was not considered as an assessment endpoint. Phytoplankton that are present in the surface waters of the offshore area are considered part of the aquatic and benthic community in the assessment.

The assessment endpoint for wildlife includes feeding guilds or taxa likely to use offshore area habitats. Previous studies have identified several species of fish as utilizing the offshore area. Therefore, piscivorous species which may consume benthos, crabs or fish are appropriate as potential wildlife receptors for wildlife. Because the offshore area is not expected to support SAV or wetland plants, herbivorous wildlife are not considered potential receptors.

Birds have been observed using the offshore area (EA 2003), and mammals, while they were not observed during habitat surveys (EA 2003), could be expected in near-shore environments. Therefore, birds and mammals are considered potential receptors. There are limited methods to assess risks to reptiles and amphibians quantitatively. Therefore, reptiles and amphibians are not included in the selection of representative receptors.

2.4.3 Exposure Pathway Analysis

Ecological receptors of concern that are potentially present at the offshore area include wildlife (birds and mammals) and aquatic/benthic organisms (fish, crab, invertebrates, and plankton). The major routes of exposure and their applicability to each of these receptor groups are presented in **Figure 2.1** and discussed below.

Ingestion

The most significant exposure route for wildlife is ingestion of chemicals in impacted media (USEPA 2003a). Wildlife may ingest chemicals in environmental media by drinking surface water or by incidentally ingesting soil and sediment while grooming or foraging. Chemicals may bioaccumulate in the tissue of plants and animals. Wildlife may also ingest chemicals accumulated in plants and animals that they consume as food. The Coke Point Peninsula offshore area is expected to support a range of wildlife, including species that consume invertebrates, small birds and mammals, and fish or aquatic organisms. Ingestion of chemicals in sediment, surface water, and/or food is considered a complete and potentially significant exposure pathway for aquatic and benthic organisms and wildlife. Because surface water is brackish, consumption would be primarily through incidental ingestion during swimming or wading.

Exposure through ingestion varies based on the feeding habits and foraging range of the species evaluated. Some aquatic organisms such as clams and worms have small home ranges and may

live and feed within the same several hundred foot wide area their entire lives. Other organisms such as fish, crabs, and wildlife, may feed in a specific area for days or months, but may leave the area to forage elsewhere.

Direct Contact/Dermal Contact

Aquatic and benthic organisms may be exposed to chemicals in sediment and surface water through direct contact and absorption through the skin and gills. Based on this information, direct exposure to sediment and surface water is considered a complete and significant pathway for aquatic and benthic organisms. Organisms such as clams and worms that live in the sediment and have small home ranges are likely to receive the greatest direct contact exposures, while more mobile organisms that also inhabit the water column are likely to have lower exposures.

Wildlife may be exposed to chemicals in air, soil (both surface and subsurface), sediment, or water via direct contact during foraging or burrowing. USEPA guidance identifies that, in most cases, dermal exposures are likely to be less significant than exposures through ingestion and their evaluation involves considerable uncertainty (USEPA 2003a). Given that fur and feathers are likely to limit dermal absorption of many chemicals, this exposure route is considered complete but relatively insignificant for wildlife. Therefore, dermal exposure for wildlife is not quantitatively evaluated in the ERA.

Inhalation

Inhalation is a potentially complete pathway for wildlife. Animals may inhale chemicals which have volatilized or which are adsorbed to airborne particulates. USEPA guidance indicates that, in general, inhalation pathways are likely to be insignificant compared to ingestion pathways (USEPA 2003a). Given the low importance set for both airborne fate and exposure, inhalation exposures are not quantitatively evaluated in the ERA.

2.4.4 Selection of Representative Receptor Species

Ecological receptors potentially present at the offshore area include wildlife (birds, mammals) and aquatic and benthic organisms. Because the ERA cannot quantitatively evaluate all of the species/receptors potentially present at a site, representative receptor species are selected. These species act as surrogates for other species that have similar diets/feeding habitats.

Selection of representative receptor species is based on several factors:

1) the likelihood of a species to use the offshore area and the area immediately surrounding the offshore area;
2) the potential for exposure to offshore area-related chemicals based on the feeding habits and life history of the organisms/guild represented by the receptor species;
3) the availability of life history and exposure information for the selected receptor species; and
4) the availability of toxicity information for the representative receptor species.

To identify potentially affected species, groups, or guilds, the feeding guilds of the organisms known to occur in the area were reviewed. Previous studies indicated that fish and crustaceans are present at the offshore area (EA 2003); therefore, aquatic and benthic organisms as well as crab- or fish-eating (piscivorous) wildlife are potential receptors. Based on this information and the determination of the assessment endpoints, the receptors evaluated in this ERA are:

- aquatic organisms including crustaceans, fish, and algae;
- benthic organisms including crustaceans, fish, bivalves, worms, and algae;
- piscivorous birds; and
- piscivorous mammals.

Aquatic and Benthic Organisms

Toxicological benchmarks for the evaluation of risk to aquatic and benthic organisms are based on a wide variety of species and taxa, including crustaceans, fish, bivalves, worms, and algae. Therefore, the overall aquatic community or benthic community is identified as the representative receptor. The benchmarks used in the evaluation are highly precautionary and are typically based on organism exposures to environmental media through a variety of pathways, including direct exposure and ingestion. Therefore, both of these pathways are examined in the assessment.

Piscivorous Wildlife

Two species were selected as representative receptors for piscivorous avian species. The great blue heron (*Ardea herodias*) is selected as an avian receptor species for evaluating potential adverse effects to birds from the ingestion of aquatic and benthic prey at the Coke Point Peninsula. Great blue heron are known to eat fish, invertebrates, and amphibians among other things. The heron is chosen as a receptor because it is likely to hunt in the shallower waters along the shoreline of the Coke Point Offshore Area, where it can walk through the water and capture prey with its bill. The osprey (*Pandion haliaetus*) is selected as an additional avian receptor species at the Coke Point Peninsula. Ospreys were observed at the offshore area. The osprey's diet is comprised almost exclusively of fish, with some aquatic invertebrates such as crabs. Unlike the heron that hunts primarily in the shallows, osprey can hunt in deeper waters, diving feet-first into the water to grab fish from near surface. Exposure data are available for quantitative evaluation of both great blue heron and osprey food chain exposures. As representative receptors, heron and ospreys act as surrogates for other piscivorous birds including gulls, cormorants, and terns.

Two species were selected as representative receptors for piscivorous mammal species. The raccoon (*Procyon lotor*) is selected as a mammalian receptor species for evaluating potential adverse effects to mammals from the ingestion of fish and aquatic invertebrates. The raccoon's diet is very diverse but includes the consumption of fish and other aquatic animals. Although the raccoon is unlikely to feed in deeper water, they may feed in the shallows along the shore. The river otter (*Lontra canadensis*) is selected as an additional mammalian receptor species. A river

otter's diet consists primarily of fish and occasionally other aquatic organisms. Otter are not necessarily expected to frequent Baltimore Harbor and the Coke Point Area in specific due to their heavily industrial nature. However, their occasional presence is a possibility, and they provide a representative receptor which can feed in deeper water beyond the shoreline. While the Coke Point shoreline does not provide ideal habitat for river otter, past impacts to the shoreline are part of the reason it provides poor habitat. Exposure data are available for quantitative evaluation of raccoon and otter food chain exposures. As representative receptors, otters and raccoon act as surrogates for other piscivorous mammals. While piscivorous mammals have not been directly observed utilizing the offshore area, otter and raccoon are evaluated as a precautionary measure.

In addition to the ingestion of chemicals in food items (prey), the inadvertent ingestion of chemicals in sediment and direct consumption of chemicals in surface water is evaluated for the above species. Wildlife may consume prey from different levels within the food chain. Prey may include lower trophic level organisms such as worms, mussels, small crustaceans, or other bivalves. Prey may also include fish or mature crabs higher in the food chain. Prey lower on the food chain are often less mobile and would experience more prolonged direct exposure to chemicals in sediments around Coke Point. Prey higher on the food chain are often very mobile, and may spend less time at Coke Point; however, they may bioaccumulate high concentrations of chemicals such as PCBs which tend to biomagnify up the food chain. Therefore, separate evaluation of different types of prey is warranted.

It is important to note that, while the risk assessment typically quantifies the potential for adverse effects to individual organisms, the objective is to be protective of the populations that use the areas around the Coke Point Peninsula. Because few methods are available to extrapolate the potential for adverse effects from the individual level to the population level, it is assumed that if there is no potential for direct adverse effects to individual organisms, then it is also unlikely for there to be the potential for direct adverse effects to populations. Similarly, it is assumed that if there is the potential for adverse effects to individual organisms, then there is also the potential for adverse effects to populations. The methodology used to evaluate exposure scenarios for these receptors is discussed further in Section 4.0.

2.5 HUMAN HEALTH RISK – EXPOSURE PATHWAYS AND RECEPTORS

The CSM for the HHRA is based on a determination of expected activities within the offshore areas. Based on the types of activities expected in the offshore environment, representative receptor populations and their activities are selected for evaluation in the HHRA.

2.5.1 Site Conditions

The Coke Point Peninsula is surrounded by the Patapsco River to the west and south, and the Turning Basin to the east. The offshore area surrounding the Coke Point peninsula is a low frequency use recreational area. Other areas that present a more attractive area for recreational use are present in close proximity but not adjacent to the Coke Point Peninsula. It is expected that people will visit the Coke Point Offshore Area infrequently and for short periods of time. However, there are no controls that prohibit use of the offshore areas around the peninsula, and

people are known to use the Coke Point Offshore Area for fishing or crabbing. White perch, Atlantic silversides, blue crabs, and other fish species were found in fish surveys completed within the offshore area.

2.5.2 Potential Receptors and Exposure Pathways

Based on the documented and potential uses of the offshore area, two populations are identified as potential receptors: recreational users and commercial watermen. Complete exposure pathways for these receptors are presented on **Figure 2.2**.

Recreational Users

Recreational users can access the offshore environment of the Coke Point Peninsula by boat. Recreational users could use the surface water bodies adjacent to Coke Point for swimming or fishing. This results in a complete contact point with chemicals identified in surface water. Because of the brackish nature of the surface water, only incidental ingestion of surface water while swimming is expected to occur. The primary contact with surface water is expected to be through dermal contact while swimming. Water depths adjacent to the Coke Point Peninsula are typically 2.5 to 6 ft near the shoreline, and drop off to deeper than 10 to 15 ft within 100 ft of the shoreline (GBA 2005). As a result, there is a possibility that recreational users may contact sediment while swimming within shallow areas of the offshore areas. Therefore, dermal contact with sediment is also considered a complete exposure pathway for recreational users, as a conservative measure. The dermal area of the recreational user exposed to sediment is the foot and lower leg. It is also expected that recreational users engage in fishing and crabbing in the area and consume their catch. Therefore, recreational users are evaluated for both fish and crab ingestion. Recreational users are evaluated for three age ranges: a child (3 to 6), an adolescent (age 6 to 16), and an adult (>16 years). Although regulatory guidance suggests the use of the age range of 0 to 6 years for a child exposure, it is assumed that a child aged 0 to 3 years would not swim or consume fish/crabs from the Coke Point Offshore area.

The following exposure routes are considered complete for recreational users:

- Dermal contact with surface water,
- Incidental ingestion of surface water,
- Dermal contact with sediment, and
- Ingestion of fish and crabs.

Commercial Watermen

Commercial watermen are also potential users of the offshore areas near the Coke Point Peninsula. Based upon local fishing methods, it is assumed that the fishermen come in contact with surface water and sediment during fishing activities. Therefore, surface water and sediment dermal contact with the skin is considered a complete exposure pathway. The dermal area of the watermen exposed to surface water and sediment is the hands and forearms only. Incidental ingestion of surface water and sediment while fishing is likely to be non-existent to minimal and is not considered a complete exposure route. It is expected that the watermen ingest the fish and

crabs collected from the area around the Coke Point Peninsula. Commercial watermen are assumed to be adults (>16 years).

The following exposure routes are considered complete for the commercial watermen:

- Dermal contact with surface water,
- Dermal contact with sediment, and
- Ingestion of fish and crabs.

The methodology used to evaluate exposure scenarios for these receptors is discussed further in Sections 5 and 6.

3. DATA USED FOR RISK ASSESSMENT

Both the ecological and human health portions of the risk assessment are based on site-specific studies of chemical concentrations in environmental media, including sediments, surface water, field-collected fish and crab tissue, and worm and clam tissue from laboratory bioaccumulation studies for both the Coke Point Offshore Area and the Patapsco River Background Area. Chemical analytical data from several sources were compiled and analyzed statistically to provide inputs for the risk assessment and allow quantitative evaluation. The subsections below describe the data sources and rationale for their inclusion (Section 3.1), methods of data quality evaluation (Section 3.2), and the methods used to statistically summarize data for use in the risk assessment (Section 3.3). Sample groupings and specific samples used in the risk assessment are summarized in **Table 3.1** and listed in **Appendix A**. Sample locations are shown in **Figures 3.1 and 3.2**. Data are also available from sample locations in other areas of the Patapsco River. Sources of data and the rationale for data inclusion are discussed below. An evaluation of alternative treatments of analytical data is provided in the Sensitivity Analysis in Appendix G; important conclusions of Appendix G that affect the interpretation of results are included in this section and in the risk assessment conclusions.

3.1 DATA SOURCES

Data are available for the Coke Point Offshore Area and the Patapsco River from a number of studies. Some of these were specifically designed to evaluate chemical sources at Coke Point, while others were designed for other purposes. As discussed in the CSM, the exposure media of concern are surface sediment and surface water; subsurface sediments were not included in the assessment. Only surface grab samples of 1 ft in depth or less were utilized in the assessment. In total, data were used from 37 sediment, 96 surface water, 10 composite fish tissues, and 10 composite crab tissue samples collected in the Coke Point Offshore Area. Data are also available from 5 composite clam and 5 composite worm tissue samples from laboratory bioaccumulation tests performed using a Coke Point sediment composite. These samples are all located within an area extending approximately 0.5 miles offshore from the Coke Point shoreline, and represent the media most likely to be influenced by Coke Point.

For the Patapsco River Background Area, data are available for 6 sediment, 9 surface water, 10 composite fish, and 10 composite crab tissue samples. In addition, data are available from 5 composite clam and 5 composite worm tissue samples from laboratory bioaccumulation tests performed using a background area sediment sample. The Patapsco River Background samples were collected from areas of the Patapsco River selected in the risk assessment work plan (EA 2010a) that would likely be beyond the influence of Coke Point and representative of regional background conditions for use in drawing relative comparisons to Coke Point data. Two samples (BKGD-SED-02 and -03) are located south of Coke Point and the Harbor channel. One sample (BKGD-SED-01) is located west of Coke Point and the Harbor channel. These locations were chosen because they are expected to represent soft sediments in depositional areas receiving inputs from the Patapsco River; samples included both surface sediment and water. Samples EH-2, EH-3, and EH-4 are located west of the Francis Scott Key Bridge near Sollers Point. These were used as reference locations in a previous study and thus were considered representative of near shore conditions in the Patapsco River; samples included only sediment. It

is important to note that the purpose of this risk assessment is to quantitatively evaluate potential risks from exposure to the offshore areas adjacent to the Coke Point Peninsula. Thus risk results based on nearby samples in the Patapsco River are included as comparison values to provide context, and are not intended as a comprehensive characterization of risks across the full reach of the Patapsco River.

3.1.1 Site Assessment for the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point (EA 2009b)

A Site Assessment (EA 2009b) was performed in 2009 to support evaluation of the proposed Coke Point DMCF. The Site Assessment examined both onshore and offshore media; it included surface sediment and surface water sampling at a total of 18 offshore locations around the entire Peninsula. VOC, metals, and PAH concentrations were determined in the surface and subsurface sediment samples. VOC and PAH concentrations were determined in surface water samples at the surface, middle, and bottom of the water column. Given that these data were collected specifically to characterize sediment and surface water chemistry in the area of concern around Coke Point, they were considered suitable for inclusion in the risk assessment. Data are evaluated quantitatively in the risk assessment as part of the Coke Point Offshore Area. Data were validated following USEPA protocol (USEPA 1992). For sediment, only surficial grab samples of 1 ft in depth or less are utilized in the assessment. Subsurface sediment samples collected from depth intervals of 0 to 2 ft or deeper were not used in the assessment because these were considered more representative of subsurface sediment.

3.1.2 Work Plan Addendum, Additional RCRA Facilities Investigation, Sparrows Point Peninsula, Offshore Area, Baltimore, Maryland (EA 2010a, 2010c)

Data from the Site Assessment were evaluated in the work plan for the risk assessment (EA 2010b) and found to provide the most recent, complete characterization of metals, PAHs, and VOCs in Coke Point Offshore Area sediment and surface water to date. However, the risk assessment Work Plan identified several data gaps associated with use of the data for risk assessment. EA proposed additional sampling in an addendum to the RCRA Facilities Investigation Work Plan (EA 2010a) and conducted sampling in March 2010 (EA 2010c). Additional sediment samples were collected and analyzed for metals, PAHs, and VOCs to better define the spatial extent of these chemicals. Also, sediments from both new sample locations and a subset of past sediment sample locations were sampled and analyzed for PCBs, dioxins, furans, and organotins because these chemicals were identified as potentially site related. Additional surface water samples were collected from three different depths at new sample locations and a subset of past locations and analyzed for metals, PAHs, and VOCs to better define spatial extent of these chemicals in surface water.

Surface water from three depths and sediment were also collected from three offsite background locations specifically chosen to provide data relevant to the risk assessment. Background sample locations were chosen in expected depositional areas of the Patapsco River beyond the anticipated influence of Coke Point or other distinct potential point sources of chemicals, and outside the Federal navigation channels. Two locations are located approximately one mile south

of Coke Point and also south of the Brewerton Navigation channel, and one sample is located approximately 1 mile northwest of Coke Point near the Francis Scott Key Bridge (**Figure 3.2**).

From this study (EA 2010c), chemical analytical data are available from 29 surface sediment samples and 96 surface water samples collected from 19 locations in the Coke Point Offshore Area. Chemical analytical data are also available from 3 sediment and 9 surface water samples from 3 locations in the Patapsco River Background Area. For sediment, only surficial grab samples of 1 ft in depth or less are utilized in the assessment. Data were validated following USEPA protocol (USEPA 1992). The sampling design and analytical suites were chosen specifically to provide data relevant to the risk assessment. Therefore, these data are evaluated quantitatively in the risk assessment as part of either the Coke Point Offshore Area or the Patapsco River Background Area dependent on location.

3.1.3 Coke Point Dredged Material Containment Facility Pre-Pilot Study Sediment Characterization (EA 2009a)

The Pre-Pilot Study (EA 2009a) was conducted to delineate the horizontal and vertical extent of the impacts to offshore sediment in an area preliminarily proposed for access channel dredging based on preliminary configurations of a potential DMCF at the Coke Point Peninsula site. The study included sampling surface sediment at a total of six locations oriented in a transect at the southeastern portion of the offshore area. Surface sediment was analyzed for metals, PCBs, semivolatile organic compounds (SVOCs), dioxins, VOCs, PAHs, and pesticides. Surface water was analyzed for metals, PCBs, SVOCs, VOCs, PAHs, and pesticides. These sample locations are situated in the Coke Point Offshore Area. Data from these samples were identified as potentially useful for the risk assessment and were subsequently validated following USEPA protocol (USEPA 1992). These data are evaluated quantitatively in the risk assessment as part of the Coke Point Offshore Area. Only surficial sediment grab samples of 1 ft in depth or less are utilized in the assessment.

3.1.4 FY05 and FY08 Evaluation of Dredged Material: Baltimore Harbor Federal Navigation Channels (EA 2007, 2009c)

Sediment data are available from periodic sampling conducted in Baltimore Harbor channels near Coke Point. This sampling is conducted every 3 years to support dredging of Federal navigation channels. The Brewerton Angle and Brewerton channels are located near Coke Point. Sampling from these navigational channels (EA 2009c, 2007) included chemical analysis of surface sediments from five locations in Brewerton Channel and five locations in Brewerton Angle and chemical analysis of two site water samples in each channel reach. Samples were analyzed for metals, PCBs, SVOCs, PAHs, pesticides, dioxins, and organotins. These channels are dredged regularly; therefore, sediments in the channels were not considered representative of depositional sediments in the Patapsco River. Therefore, data from this sample area are considered representative of other far field areas within the Patapsco River, but are not considered as part of the Patapsco River Background Area. Surface sediment data for other far field areas of the Patapsco River were not used quantitatively in the risk assessment.

Surface water data are also available from 13 samples collected located within Baltimore Harbor and the Patapsco River. Samples were analyzed for metals, PCBs, SVOCs, PAHs, pesticides, dioxins, and organotins. These samples are located distant from the area of concern, and data are unvalidated. Therefore, data were not used quantitatively in the risk assessment. However, surface water samples from the most recent sampling event (EA 2009c) are considered representative of widespread, far field conditions in the Patapsco River, and are used as part of the Sensitivity Analysis presented in **Appendix G**. The Sensitivity Analysis evaluates data from 11 of the 13 samples to provide context for sample results from background samples discussed in Section 3.1.2 (EA 2010a). Samples Northwest Channel (East and West Branches) were excluded because they are located near known areas of elevated chemical concentrations.

3.1.5 Feasibility Studies of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions (EA 2004)

Sediment data are available from a feasibility study conducted to characterize environmental conditions around Sparrows Point pertinent to use as a containment site for placement of Harbor dredged material (EA 2004). The Feasibility Study included sediment sampling at four locations at multiple depths, and samples were analyzed for metals, PCBs, SVOCs, VOCs, PAHs, pesticides, dioxins, and organotins. These samples are located distant from Coke Point. Sediment samples EH-2 through EH-4 are located to the northwest near the Francis Scott Key Bridge. Sample EH-1 is located to the east of Sparrows Point. Data were validated. Data from samples EH-2 through EH-4 are considered representative of background within the Patapsco River, and are therefore considered as part of the Patapsco River Background Area.

3.1.6 Reconnaissance Study of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions (EA 2003)

Sediment data are available from a reconnaissance study conducted to characterize environmental conditions around Coke Point pertinent to potential use as a containment site for placement of Harbor dredged material (EA 2003). This study included five locations to the west, south, and east of Coke Point. Surface sediment samples were analyzed for metals, PCBs, SVOCs, PAHs, dioxins, pesticides, and organotins. Data were reviewed for relevance and usability in the risk assessment work plan (EA 2010b). Sediment samples S-B1 through S-B4 are located in the Coke Point Offshore Area. Data from these samples were identified as useful for the risk assessment and were subsequently validated. They are evaluated quantitatively in the risk assessment as part of the Coke Point Offshore Area. Only surficial sediment grab samples of 1 ft in depth or less are utilized in the assessment.

Sample S-B5 is located distant from Coke Point to the east. It is relatively close to other portions of the Sparrows Point Steel Mill Facility, and therefore it was considered potentially inappropriate for consideration in the Patapsco River Background Area as potential chemical influences are unknown. Therefore, data from this sample are considered representative of other far field areas within the Patapsco River, but are not considered as part of the Patapsco River Background Area.

3.1.7 Laboratory Bioaccumulation and Field-Collected Tissue Study Report (EA 2011)

Data are available from bioaccumulation field and laboratory studies that involved collection of sediment composite samples and tissue samples from around Coke Point and Sollers Point in the fall of 2010. Tissue data are available for blue crab (*Callinectes sapidus*) meat and mustard and white perch (*Morone americana*) whole body tissue and filets collected at both locations during these field studies. Tissue data are also available for clams (*Macoma nasuta*) and aquatic worms (*Nereis virens*) from laboratory bioaccumulation studies performed using the sediment composites. The Laboratory Bioaccumulation and Field-Collected Tissue Study Report is attached to this document as **Appendix H**. Sediments and tissue were analyzed for metals, PAHs, and PCBs. Data were validated. Tissue data from these studies are used in the ecological risk assessment and human health risk assessment to estimate concentrations of these chemicals in food items that could be consumed by wildlife or humans as part of exposure modeling.

3.2 DATA QUALITY EVALUATION

All data used in the risk assessment are validated per protocols identified in USEPA guidance for data usability (USEPA 1992). Validation is a standardized process for assessing the accuracy and precision of chemical analytical data and assigning qualifiers that indicate what considerations apply when interpreting results. Inclusion or exclusion of data on the basis of analytical qualifiers is performed in accordance with USEPA guidance (USEPA 1989, 1992). The first step in the risk assessment process is the evaluation of analytical data on the basis of qualifiers in each medium of concern (surface sediment, surface water, and tissue) using the rationale below.

- Analytical results bearing the R qualifier (indicating that the data point was rejected during the data validation process) are not used in the risk assessments.
- Analytical results bearing the U or UJ qualifier (indicating that the analyte is not detected at the given reporting limit [RL]) are retained in the data set and considered non-detects (ND). Where warranted for statistical purposes, each COPC is assigned a numerical value equal to its RL.
- Analytical results bearing the J qualifier for organics (the reported value is estimated and below the RL), K qualifier (reported value may be biased high), L qualifier (reported value may be biased low), and N qualifier (the spiked recovery is not within control limits) are retained in the data set at the measured concentration.
- Analytical results for inorganic chemicals bearing the B or BJ qualifiers are retained in the data set at the measured concentration. B or BJ qualifiers indicate that the reported value is less than the RL, but greater than the method detection limit (MDL).
- Analytical results for organic compounds bearing the B qualifier (blank-related data) are evaluated as non-detects. The B qualifier denoting blank-related data indicate that the chemical in question was detected not only in the sample but in quality assurance blanks.

If duplicate samples are collected or duplicate analyses are conducted on a single sample, the following guidelines are employed to select the appropriate sample measurement:

- If both samples/analyses show that the analyte is present, the average of the two detected concentrations is retained for analysis, based on conservative professional judgment;
- If both samples/analyses are not detected, the average of the two RL concentrations is retained for analysis as a non-detect; and
- If only one sample/analysis indicated that the analyte is present, it is retained for analysis and the non-detect value is discarded.

3.3 STATISTICAL DERIVATION OF EXPOSURE POINT CONCENTRATIONS

The primary use of chemical analytical data in the risk assessment is to develop exposure point concentrations (EPCs). The EPC represents a reasonable estimate of the COPC concentration that likely will be contacted over time. Chemical analyses provide the chemical concentrations detected at each sample location. Some organisms, such as clams and worms, may be exposed to concentrations at a single location for most of their life span. However, most fish, crustaceans, wildlife, and humans are likely to move throughout the offshore area and may be exposed to sediment or surface water at many locations over time. Therefore, statistics are used to calculate EPCs that represent overall exposures (USEPA 1989, 1991, 1997a).

As discussed in the CSM (Section 2.0), ecological and human receptors may be exposed to chemicals in surface sediment and surface water. These receptors also may be exposed to chemicals through consumption of fish, crabs or other aquatic organisms that have accumulated chemicals from sediment or surface water. Therefore, the risk assessment uses EPCs for exposure to three media: sediment, surface water, and tissue of organisms that accumulate chemicals from water and sediment. EPCs for sediment and surface water are calculated directly from chemical analytical results of these media. EPCs for metals, PAHs, and PCBs in aquatic organism tissue are derived from the field-collected fish and crabs and from the laboratory bioaccumulation studies (clams and worms). The tissue data are presented in **Appendix H**. EPCs for other chemicals in aquatic organism tissue are calculated using uptake factors from the scientific literature. EPCs for tissue are further distinguished as derived from fish, crab, or benthic organisms. **Table 3.2** and **Table 3.3** provide a description of how different EPCs for each media are used in ecological and human health risk exposure scenarios.

3.3.1 Methods of Summation for PCBs, Dioxins, and PAHs

In calculating EPCs, Some classes of organic chemicals are best evaluated as a summation of individual concentrations to provide a total concentration for the group because they share similar fate and toxicity. This is the case for PCBs and dioxins, for which special methods of summation have been developed for use in both human health and ecological risk assessment. The exposure estimate procedures for each of these classes are described below.

- **PCBs** – There are over 200 PCB congeners that can be commonly found in environmental media. USEPA guidance has identified a standard method for using congener-specific data to estimate the total concentration of PCBs (Van den Berg et al. 1998). Per this method, the concentrations of 18 specific congeners are summed and the sum doubled for each sample. The specific PCB congeners used in the evaluation are: PCB 8, PCB 18, PCB 28, PCB 44, PCB 49, PCB 52, PCB 66, PCB 77, PCB 87, PCB 90,

PCB 101, PCB 105, PCB 118, PCB 126, PCB 128, PCB 138, PCB 153, PCB 156, PCB 169, PCB 170, PCB 180, PCB 183, PCB 184, PCB 187, PCB 195, PCB 206, and PCB 209. Two estimates of total PCBs are provided: one in which RLs are used to represent non-detected compounds, and one in which non-detects are assumed to indicate that no compound is present. Using RLs is likely to overestimate the total amount of PCB present, while use of zero concentrations to represent non-detects is likely to underestimate concentrations.

- **Dioxins and Furans** – For dioxins and furans, studies have been performed to develop toxicity equivalency factors (TEFs) that relate the toxicity of common dioxin and furan congeners to the specific toxicity of the dioxin 2,3,7,8-TCDD (Van den Berg et al. 1998, 2006). Separate TEFs have been developed for humans/mammals, fish, and birds. These TEFs can be used to produce a weighted summation called a Toxicity Equivalency Quotient (TEQ). This method is used to calculate sediment EPCs for aquatic and benthic organisms. Because laboratory results for individual dioxins utilize the RL to represent non-detects, two TCDD TEQ values are calculated. One uses RLs to represent non-detects in statistical calculation of EPCs, and one uses zero to represent non-detects.

This is also the case for PAHs, but only as applied to ecological risk assessment. The HHRA evaluates PAHs on an individual chemical basis. The exposure estimate procedures for each of these classes are described below.

- **LMW PAHs** – Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors (USEPA 2007f). Therefore, concentrations for individual LMW PAHs were summed. Two estimates of LMW PAH are provided: one in which RLs are used to represent non-detected compounds, and one in which non-detects are assumed to indicate that no compound is present. Using RLs is likely to overestimate the total amount of PAH present, while use of zero concentrations is likely to underestimate concentrations. Therefore, both estimates are used in statistical calculation of EPCs. LMW PAHs include 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, fluoranthene, naphthalene, and phenanthrene.
- **HMW PAHs –** EPCs for high molecular weight (HMW) PAH compounds share similar modes of toxicity, and it is most appropriate to examine exposures to these compounds as a whole. Therefore, concentrations for individual HMW PAHs were summed. Two estimates of HMW PAH are provided: one in which RLs are used to represent non-detected compounds, and one in which non-detects are assumed to indicate that no compound is present. Using RLs is likely to overestimate the total amount of PAH present, while use of zero concentrations is likely to underestimate concentrations. Therefore, both estimates are used in statistical calculation of EPCs. HMW PAHs include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene.

Sediment EPCs were developed using the summations as described. Summation of dioxins and PCBs was not necessary for calculation of surface water EPCs as these compounds were not

analyzed for in surface water. PAHs in surface water were summed for ecological receptors by applying the methods described above. To develop tissue EPCs, PCBs were summed as described above for use in developing EPCs and BAFs. For PAHs and dioxins, tissue concentrations were not summed but were carried through exposure models for wildlife separately so that food web doses could be summed instead. This is described in Section 4.2.1.1.

3.3.2 Sediment EPC Calculation

The ERA and the HHRA evaluate two separate EPCs for sediment: one representing the maximum detected concentration to which a receptor could be exposed, and one representing overall or average exposures for each chemical.

In both the HHRA and ERA, evaluation of the maximum detected concentration to which a receptor could be exposed is called the screening EPC, and evaluation of the overall or average concentration to which a receptor could be exposed is called the reasonable maximum EPC. Assessment using the screening EPC evaluates a worst case scenario by assuming biota or humans are exposed to the location(s) with the highest concentrations of chemicals for their entire lives/duration of exposure. This provides useful information for the ERA because some bottom-dwelling organisms live their entire lives in or around a single location. The screening EPC is evaluated in the ERA for aquatic organism and wildlife exposures as a precautionary measure to identify COPCs that require further evaluation in the assessment. The HHRA evaluates the maximum detected concentration in sediment for initial screening of chemical concentrations as a precautionary measure. For risk comparisons between the Coke Point Offshore Area and the Patapsco River Background Area, the maximum concentration in sediment is used as the screening scenario EPC in both areas.

Screening is used to identify COPCs to be carried forward into the risk assessment, but is not representative of most exposures for people or mobile organisms such as fish, crustaceans, birds, and mammals which may use the entire offshore area. Therefore, for these receptors, a statistically derived value is used to estimate overall exposures across the site. EPCs calculated using this statistically derived value are referred to as reasonable maximum EPCs because the exposure level is more reasonable given the fact that receptors may move around the site. The statistically derived value is a precautionary estimate of the central tendency of the chemical concentrations for the site and represents overall exposures over time (EPA 1989).

For the Coke Point Offshore Area, the 95 percent upper confidence limit of the mean (95%UCLM) is used as a precautionary estimate of central tendency; this is consistent with USEPA guidance (USEPA 1989). The 95%UCLM is determined through the use of the USEPA ProUCL program version 4.00.04 (USEPA 2009c). The 95%UCLM is used as the reasonable maximum EPC except in cases where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration. In these cases, the maximum detected concentration is used as the reasonable maximum EPC. EPCs are presented with frequency of detection in **Table 3.4** and **Table 3.6**. Output files of the ProUCL program are included in **Appendix B**. For inputs to the program, RLs were used to represent non-detected results.

The same methodology for deriving sediment EPCs was used for the Patapsco River Background Area. The 95%UCLM is used as the reasonable maximum EPC except in cases where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration. In these cases, the maximum detected concentration is used as the reasonable maximum EPC. Because the background data set is composed of a small number of samples, and because some chemicals are detected infrequently in background, there are a number of cases where a 95% UCLM could not be calculated and the sediment EPC defaulted to the maximum detected concentration. Using maximum concentrations to represent background creates uncertainties and may provide a less precautionary estimate of relative risks for use in comparisons between Coke Point Offshore Area and Patapsco River Background Area. Therefore, the sensitivity analysis presented in **Appendix G** evaluates the effects of using the median of background data as a more precautionary EPC. It also evaluates data from other methods of estimating sediment background concentrations.

The ERA uses both the screening EPCs and reasonable maximum EPCs to model food web exposures for biota (**Table 3.2**). In accordance with USEPA guidance (USEPA 1989), the HHRA uses reasonable maximum EPC for all modeled exposure scenarios (**Table 3.3**). EPC calculations for both ecological and human health risk assessments utilize chemical analytical results from each sediment sample as an independent data point in the statistical evaluation.

3.3.3 Surface Water EPC Calculation

The ERA and the HHRA evaluate two separate EPCs for surface water: the screening EPC representing the maximum detected concentration to which a receptor could be exposed, and the reasonable maximum EPC representing overall or average exposures for each chemical. The screening EPC is evaluated in the ERA for aquatic organism and wildlife exposures to identify COPCs that require further evaluation in the assessment. The HHRA evaluates the maximum detected concentration in sediment for initial screening of chemical concentrations as a precautionary measure. For risk comparisons between the Coke Point Offshore Area and the Patapsco River Background Area, the maximum concentration in surface water is used as the screening scenario EPC in both areas.

However, the reasonable maximum EPC is the most relevant exposure for surface water exposures in the Coke Point Offshore Area because wind, currents, and tides cause frequent mixing of chemical concentrations in water. The 95%UCLM was calculated as the reasonable maximum EPC representative of the central tendency for surface water concentrations in Coke Point Offshore Area. The 95%UCLM was determined through the use of the USEPA ProUCL program version 4.00.04 (USEPA 2009c). Where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration, the maximum detected concentration is used as the reasonable maximum scenario EPC. EPCs are presented with frequency of detection in **Tables 3.5** and **3.7**. Output files of the ProUCL program are included in **Appendix B**. For inputs to the program, RLs were used to represent non-detected results.

The same methodology for deriving sediment EPCs was used for the Patapsco River Background Area. The 95%UCLM is used as the reasonable maximum EPC except in cases where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration. In

these cases, the maximum detected concentration is used as the reasonable maximum EPC. Because the background data set is composed of a small number of samples, and because some chemicals are detected infrequently in background, there are frequent cases where a 95% UCLM could not be calculated and the surface water EPC defaulted to the maximum detected concentration. As discussed above for sediment, this creates uncertainties and may provide a less precautionary estimate of risks for use in comparisons between Coke Point Offshore Area risks and Patapsco River Background Area risks. Therefore, the sensitivity analysis presented in **Appendix G** evaluates the effects of using the median of background data as a more precautionary EPC. It also evaluates data available from other surface water sampling conducted in the Patapsco River. For surface water, median values are often non-detects; therefore, **Appendix G** also provides an analysis of the effects of using statistics based on method detection limits (MDLs) instead of RLs.

The ERA uses both the screening EPCs and reasonable maximum EPCs to model food web exposures for biota. In accordance with USEPA guidance (USEPA 1989), the HHRA uses reasonable maximum EPC for all modeled exposure scenarios. EPC calculations for both ecological and human health risk assessments utilize chemical analytical results from each surface water sample at each depth as an independent data point in the statistical evaluation.

3.3.4 Aquatic Organism Tissue EPC Calculation

As discussed above, both wildlife and humans may be exposed to chemicals through ingestion of tissue from fish or other aquatic organisms that have accumulated chemicals from surface water or sediment. Therefore, EPCs representative of chemical concentrations in aquatic organisms are used in ingestion exposure models. The ecological and human health risk assessments use aquatic organism food item EPCs derived from several sources.

The ecological risk assessment examines separate scenarios that represent consumption of three different types of prey item - benthos, crab, and fish. **Table 3.2** summarizes the data source used for each of these scenarios. Tissue concentrations for benthos are based on site specific sediment BAFs, while tissue concentrations in crabs and fish are based on site-specific data from field-collected specimens. Where site-specific data are not available, BAFs from the scientific literature are used. BAFs are multipliers that relate the concentration of chemicals expected in tissue to the concentrations detected in sediment or surface water. In both cases, concentrations of PCBs were summed prior to use in food web models by applying to tissue concentrations the same methods as described in Section 3.3.1. Dioxins and PAHs were carried through exposure models individually and summed afterwards; this is described in detail in Section 4.2.1.1.

Two separate human health risk assessments of fish and crab consumption were performed: HHRA–PH and HHRA-SC. These are summarized in **Table 3.3**. In both, people are assumed to consume crabs and fish. The first, HHRA-PH, evaluates site-specific data from field-collected specimens. The second, HHRA–SC, derives tissue concentrations from BAFs. Where site-specific data are not available, BAFs from the scientific literature are used in both scenarios. In both scenarios, PCBs and dioxins were summed before use in exposure models by applying to tissue the same methods described in Section 3.3.1.

There are advantages to each of the two methods discussed above (site-specific BAFs versus field-collected tissue) for calculating tissue EPCs. The lab bioaccumulation tests used to derive BAFs as part of the site-specific bioaccumulation study presented in **Appendix H** are a highly reliable means of linking exposure to chemical concentrations in sediment to concentrations accumulated in tissue. Uptake is not influenced by the mobility of organisms or variations in field conditions. Thus scenarios based on BAFs from lab bioaccumulation tests provide the best measure of potential contributions from chemical sources in Coke Point sediments to site-specific exposures and risks assuming contact only to the site area evaluated. Alternatively, EPCs derived from field-collected tissue are more likely to incorporate the influence of field variations and organism movement beyond the site. Therefore, tissue EPCs based on concentrations detected in actual fish and crab collected from the Coke Point Offshore Area provide a better measure for predicting the actual exposures experienced by people and wildlife consuming these organisms from the site at the time of sampling. Different scenarios were evaluated so that the advantages of each data source can be used to interpret risk assessment results.

3.3.4.1 EPCs derived using bioaccumulation factors (BAFs) from Coke Point laboratory bioaccumulation tests

The laboratory bioaccumulation studies performed to support this risk assessment were specifically designed to measure uptake from sediment into the tissues of aquatic organisms (EPA 2000; USEPA/USACE 1991, 1998). Organisms were exposed to composited sediments collected from the area around Coke Point and from the vicinity of Sollers Point in the Patapsco River background area. After 28 days of exposure, these organisms were removed from the test chambers, depurated, and analyzed for metals, PAHs, and PCBs. The laboratory bioaccumulation tests were performed using standard methods and test species as discussed in detail in **Appendix H**.

Laboratory bioaccumulation test results provide information for use in the risk assessment of the Coke Point Offshore Area. The test species (clams and worms) used in standardized bioaccumulation tests are lower trophic level organisms. These species are directly representative of the kinds of organisms that wildlife, fish, and crabs consume routinely. They indirectly represent bottom-dwelling species that humans are more likely to consume such as crabs, assuming that such organisms spend large amounts of time around Coke Point. Based on this information, laboratory bioaccumulation estimates based on lab bioaccumulation test results are directly applicable to ecological risk assessment. The concentrations of metals, PAHs, and PCBs detected in clam and worm tissues are used together with the concentrations detected in the composited sediment to develop site-specific sediment BAFs. Sediment BAFs are multipliers that relate the concentration of chemicals expected in tissue to the concentrations detected in sediment. Statistical derivation of BAFs is presented in **Appendix H**. Sediment BAFs used in this risk assessment are presented in **Table 3.8**. BAFs were selected as the highest of the 95%UCLM BAFs from either clams or worms exposed to Coke Point sediments. Sediment BAFs are used to predict benthic organism tissue concentrations using the following equation:

$$\boxed{C_{org\text{ - }sed} = C_{sed} * BAF_{org\text{ - }sed}}$$

Where:

$C_{org\text{-}sed}$	=	EPC of chemical in benthic organism tissue [milligrams per kilogram (mg/kg) wet weight] taken up from sediment;
C_{sed}	=	EPC of chemical in sediment (mg/kg dry weight);
$BAF_{org\text{-}sed}$	=	bioaccumulation factor for chemicals from sediment into aquatic organism (unitless).

Either the screening or the reasonable maximum exposure EPCs were used as C_{sed} in the equation dependent on the scenario (**Table 3.2** and **Table 3.3**). Tissue EPCs based on BAFs are presented in **Tables 3.4** through **3.7**. BAFs from organisms exposed to Coke Point sediment were applied to sediment concentrations from both the Coke Point Offshore Area and the Patapsco River Background Area. This was done because BAFs based on sediment containing frequent non-detections and low concentrations of chemicals tend to produce unrealistically high estimates of uptake.

There are several advantages to using laboratory bioaccumulation test results to derive tissue EPCs. Organisms in laboratory bioaccumulation tests are exposed directly to the sediments in question under controlled conditions, providing certainty as to where and when uptake occurred. This is an advantage over field-collection of organisms because it is often uncertain as to whether certain types of field-collected organisms may have migrated from other areas. It also accounts for the effects of site-specific grain size, carbon content, and sulfide-minerals on bioavailability and uptake. BAFs are a relevant tool for this assessment because, as documented in **Appendix H**, concentrations were higher in test organisms exposed to Coke Point Offshore Area sediments than in organisms exposed to background sediments.

3.3.4.2 EPCs derived from field-collected fish and crab tissue

Field collection of tissue characterizes actual tissue concentrations in aquatic organisms. This presents a more realistic representation of bioaccumulation in higher trophic level game species at Coke Point because many aquatic organisms are mobile and may spend time feeding in other parts of Baltimore Harbor or the Chesapeake Bay.

The bioaccumulation studies performed to support this risk assessment included field-collection of fish and crab tissue from the area around Coke Point and in the vicinity of Sollers Point in the Patapsco River background area. Study design, methods, and results are presented in **Appendix H**. The species collected (white perch and blue crab) are directly representative of the kinds of organisms that humans and larger wildlife may consume. Therefore, bioaccumulation estimates based on field-collected tissue are most directly applicable to human health risk assessment but also bear relevance to ecological exposures. Crab and fish tissues were analyzed for metals, PAHs, and PCBs. The study found that in many cases, concentrations of these chemicals were statistically significantly higher in crab and fish collected from the area around Coke Point compared to those from around the Patapsco River Background Area.

Tissues from common game fish species (white perch and blue crab) were collected to provide an indicator of the concentrations of chemicals to which watermen and wildlife might be exposed around Coke Point. Composited fish filets were analyzed as representative of what humans

would most likely consume, and composited whole body fish were analyzed as representative of what wildlife would most likely consume. For crabs, both meat and "mustard" were analyzed separately. Mustard is a digestive organ within the crab that may accumulate higher concentrations of chemicals than muscle. It is often consumed as a delicacy. It was assumed that both humans and wildlife would consume all of the meat and mustard within an individual crab.

Therefore, to determine the total concentration of a chemical within the edible portion of the crab, the following equation was used:

$$C_{EdCrab} = \frac{C_{Mustard} * M_{Mustard} + C_{Meat} * M_{Meat}}{M_{EdCrab}}$$

Where:

C_{EdCrab}	=	Concentration of chemical in the edible portion of the crab (mg/kg wet weight);
$C_{Mustard}$	=	Concentration of chemical in crab mustard (mg/kg wet weight);
C_{Meat}	=	Concentration of chemical in crab meat (mg/kg wet weight);
$M_{Mustard}$	=	Weight of mustard per individual crab [grams (g) wet weight];
M_{Meat}	=	Weight of meat per individual crab (g wet weight).
M_{EdCrab}	=	Summed Weight of the meat and mustard from individual crab (g wet weight).

The ratio of meat to mustard in the crab by mass was assumed to be 4.36:1 based on information from the literature (Weidou 1981).

Tissue concentrations were summarized statistically to create EPCs. **Tables 3.2** and **3.3** present which EPCs (screening or reasonable maximum) were used for each ecological and human health scenario. For the reasonable maximum exposure scenario, the 95% Upper Confidence Limit of the Mean (UCLM) of tissue concentrations for each chemical were used as the EPCs in fish filets and whole body fish. The 95%UCLM for crab meat and mustard were used as described above to calculate the concentration in edible crab tissue.

3.3.4.3 EPCs derived using sediment BAFs from literature sources

Laboratory bioaccumulation tests for Coke Point focused on the environmental medium (sediment) and the chemical types (metals, PAHs, and PCBs) considered most likely to drive source-related risks. Therefore, they did not include testing and analysis of other chemicals in tissue. Instead, BAFs for these chemicals and media were derived from the scientific literature.

Literature Sources for Sediment BAFs – Sediment BAFs are derived from the scientific literature for dioxins, VOCs, and organotins. These compounds were not included in site-specific bioaccumulation studies as a cost-saving measure because screening analysis indicated that these chemicals were likely to produce risks lower than metals, PAHs, and PCBs. Sediment

BAFs for dioxins, VOCs, and organotins are presented in **Table 3.8**. The U.S. Army Corps of Engineers (USACE) maintains a database of chemical-specific biota-sediment bioaccumulation factors (BSAFs) from studies of a wide range of organisms and sediment types (USACE 2009). This database is made available for use in assessment of sediments and dredged material. Laboratory bioaccumulation tests following protocols the same as or similar to those used in this study are one of the primary sources of BSAFs in the database. A BSAF is different from a sediment BAF because it considers the influence of organic carbon in sediment and lipids in tissue on uptake relationships (USACE 2009). For each chemical, EA compiled the mean BSAFs reported for fish and marine and estuarine invertebrates. For each chemical, the average of the BSAFs is calculated, and the values are converted to sediment BAFs using the following equation:

$$BAF_{org\text{-}sed} = \frac{C_{lipid}}{C_{TOC}} \times BSAF$$

Where:

C_{lipid} = Concentration of lipid in tissue (mg/kg dry weight);
C_{TOC} = Concentration of total organic carbon in sediment (mg/kg dry weight);
BSAF = Biota sediment accumulation factor (unitless);
$BAF_{org\text{-}sed}$ = Bioaccumulation factor for chemicals from sediment into biota (unitless)

The conversion assumes an average total organic carbon content in Coke Point sediments of 6.8 percent based on sample results from Coke Point Offshore Area surface sediment samples. The conversion assumed an average whole body lipid content of benthic prey organisms of 7.1 percent based on lipid information provided in the USACE BSAF database for fish and marine and estuarine invertebrates. These sediment BAFs are considered technically defensible for use in wildlife exposure models because they are developed from consideration of a variety of studies and organisms, incorporate site-specific physical data factors, are developed from well-accepted guidance, and are specific to marine and estuarine environments. When sediment BAFs were not available from this source, a default value of 1 was assigned. This assumes that the concentration in the organism is the same as the concentration in the sediment. This default is used as a standard practice in risk assessment. There are adequate data available from the BSAF database (USACE 2009) for estuarine organisms to develop a BSAF for TCDD that would be relevant to estuarine exposures. However, the database did not contain adequate studies of other dioxin/furan congeners in estuarine organisms to develop BSAFs for the full list of detected congeners. The USACE BSAF database (USACE 2009) does include BSAF data for both TCDD and other dioxin and furan congeners from a study of trout, which is a freshwater fish (Burkhard et al. 2004). These freshwater BSAFs are used together with the estuarine TCDD BSAF to extrapolate estuarine BSAFs for each congener based on relative bioaccumulation compared to TCDD. These BSAFs are presented in **Table 3.8**.

3.3.4.4 EPCs derived using surface water BAFs from literature sources

As discussed above, laboratory bioaccumulation tests for Coke Point focused on the environmental medium (sediment) considered most likely to drive source related risks. Therefore, they did not include testing and analysis of uptake from surface water. Instead, BAFs for chemicals in surface water are derived from information reported in the scientific literature.

Literature-based water-to-fish uptake factors or bioaccumulation equations are used to estimate concentrations of COPCs in fish tissue using the following equation:

$$C_{fish} = C_{water} * BAF_{fish-water}$$

Where:

C_{fish}	=	Concentration of chemical in fish [mg/kg wet weight];
C_{water}	=	Maximum concentration or 95%UCL of COPC in water (milligrams per liter [mg/L]);
$BAF_{fish-water}$	=	Uptake factor for chemicals in fish (unitless).

The maximum or reasonable maximum scenario COPC concentrations detected in surface water are used as the C_{water} value in the equation. Bioaccumulation factors and their sources are summarized in **Table 3.9**. Uptake factors for several organics are derived using regressions from the BCF Win Program developed by the USEPA's Office of Pollution Prevention and Toxics and Syracuse Research Corporation. When these uptake factors are not available for a chemical, literature-based factors are used from sources such as the Risk Assessment Information System (Oak Ridge National Laboratory 2009); USEPA's Ambient Aquatic Life Water Quality Criteria documents (USEPA 1980, 1985a-c, 1986, 1987a,b) the California Office of Environmental Health Hazard Assessment (OEHHA) (OEHHA 2000); and sources cited in EPA guidance for risk assessment of hazardous waste combustion products (EPA 1999c).

In the absence of a literature-based bioaccumulation model or uptake factor for a COPC, an accumulation factor of 1 is used to estimate chemical concentrations in fish. Use of this default accumulation factor assumes that the concentration in the organism is the same as the concentration in the surface water and is expected to provide a conservative estimate of accumulation for most chemicals and is expected to overestimate accumulation for non-bioaccumulative compounds. This default is used as a standard practice in risk assessment.

3.4 EVALUATION OF THE SPATIAL DISTRIBUTION OF CHEMICAL CONCENTRATIONS

Evaluation of EPCs provides an indicator of population-wide risks for offshore areas. However, it is useful to understand the spatial distribution of chemicals on a sample by sample basis when interpreting and applying risk assessment results. Therefore, spatial distribution of chemical concentrations was evaluated in relation to background concentrations. **Figures 3-3** through **3-12** present the spatial distribution of select chemicals detected in surface sediment in the Coke

Point Offshore Area. The chemicals selected for inclusion in these figures exceed background concentrations and demonstrate spatial patterns representative of other co-located chemicals.

Spatial analysis revealed that, for many metals (e.g., arsenic, copper, lead, zinc, etc.), PCBs, and PAHs, chemical concentrations in surface sediments are elevated 1 to 2 times above background within a roughly 1,000-ft buffer along the Coke Point shoreline. Concentrations of these metals are elevated up to five times or more above background in two general areas: the area to the south and west of the mouth of the Turning Basin, especially at locations BH-SED-09, BH-SED-10 and BH-SED-10B; and the area west of the Coke Oven Area along the transect associated with sample BH-SED-03. Concentrations in these areas are likely to contribute the greatest potential for risk.

A similar trend is observed for PAHs in surface water. Chemical concentrations of HMW PAHs, toluene, and ethylbenzene were detected at concentrations in surface water elevated above those in the Patapsco River Background Area. Concentrations of toluene and ethylbenzene in surface water are highest at locations immediately offshore of Coke Point at locations BH-W-04, -05, -06, -09, and -10. Concentrations of HMW PAHs are highest in surface water at locations immediately offshore of Coke Point at locations BH-W-06 and -10B. **Figures 3-13** through **3-15** present the spatial distribution of select chemicals detected in surface water in the Coke Point Offshore Area. PAHs were selected for inclusion in these figures because they consistently exceed background concentrations. Concentrations of PAHs in surface water are highest at sample locations immediately along the shoreline. This is consistent with what is known of fate and transport at the site, because plumes of organic compounds in groundwater are known to enter surface water at the shoreline (EA 2009b). Also, sediments along the shoreline are impacted with residual non-aqueous phase liquid (NAPL) and are most likely to be disturbed along the shoreline by wave action. Both factors would result in elevated concentrations of PAHs in water due to flux from other environmental media (groundwater and sediment). PAHs did not demonstrate a clear trend in vertical distribution, and were detected at a variety of depths (surface, mid-water column, and deep). Concentrations of metals in surface water did not show a distinct spatial distribution.

4. ECOLOGICAL RISK ASSESSMENT

The CSM for ecological receptors presented in Chapter 2 identified specific assessment endpoints and representative receptor species for evaluation. Chapter 3 presented the data available to support this evaluation, and discussed how it is used to derive basic risk assessment endpoints. The ERA for the Coke Point Offshore Area is conducted in accordance with USEPA guidance applicable to RCRA sites (USEPA 1997a). ERA follows a process in which exposure and toxicity data are combined to develop an estimate of the potential for adverse impacts on ecological receptors from chemicals in the environment. Per USEPA guidance, an ERA begins with a very precautionary evaluation of the potential for risks (USEPA 1997a). This is called a screening level ERA. The ERA effort for the Coke Point Offshore Area includes methods typical of a screening level ERA, but also incorporates more refined evaluation methods such as evaluation of a reasonable maximum exposure scenario, consideration of background risks, evaluation of site-specific tissue data, and discussion of site-specific habitat and bioavailability considerations. Consistent with guidance (USEPA 1997a), the ERA includes an exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis for each receptor evaluated.

The ERA applies a weight-of-evidence approach for each assessment endpoint evaluated. In a weight-of-evidence approach, multiple lines of evidence are evaluated, and their individual significance, or weight, is considered to derive a conclusion. Each line of evidence is a measurement endpoint. Measurement endpoints are quantifiable ecological characteristics that are related to each assessment endpoint (USEPA 1989). Because assessment endpoints are often defined in terms of ecological characteristics that are hard to measure (i.e., the health of a population or community), measurement endpoints are selected to provide a quantifiable means of characterizing risks. Measurement endpoints for this ERA are selected based on standard risk assessment methodology (USEPA 1997a) with consideration of the readily available data (Chapter 3).

Quantitative and qualitative measurement endpoints are summarized in **Table 4.1** and used to characterize risks as described in the sections below. Assessment of ecological risks to aquatic and benthic organisms is presented in Section 4.1. Assessment of ecological risks to birds and mammals is presented in Section 4.2. Discussion of uncertainties is presented in Section 4.3.

4.1 ASSESSMENT OF RISKS TO AQUATIC AND BENTHIC ORGANISMS

The CSM for Coke Point in **Figure 2.1** identifies the viability of aquatic and benthic organism communities as an assessment endpoint for protection. Because most toxicological data for benthic and aquatic organisms is based on a broad range of species, specific representative receptors were not selected. Instead the overall aquatic and benthic communities are identified as representative receptors.

Measurement endpoints evaluated for aquatic and benthic organisms include comparisons of EPCs in sediment and surface water to toxicological benchmarks; comparison of offshore area concentrations of chemicals to background concentrations; and qualitative consideration of

factors affecting bioavailability. Exposure and toxicity assessments are presented in Sections 4.1.2 and 4.1.3 to support evaluation of these measurement endpoints.

4.1.1 Exposure Assessment

The primary route of exposure for aquatic or free swimming organisms is through direct contact with and ingestion of surface water. The primary route of exposure for benthic organisms is through direct contact with and ingestion of sediment.

To represent potential aquatic and benthic organism exposures in the Coke Point Offshore Area, two scenarios are evaluated as representative of potential exposures. Because some bottom-dwelling organisms live their entire lives in or around a single location, the maximum concentration of each chemical detected in sediment and surface water will be evaluated as an EPC. EPCs are presented in **Tables 3.4** and **3.5**. This is referred to as the screening exposure scenario, and evaluates a worst case scenario for relatively immobile organisms that could be exposed to the location(s) with the highest concentrations of chemicals for their entire lives. Similarly, the maximum detected concentration in surface water is used as the EPC for the screening exposure scenario to represent potential worst case conditions that could occur in water, and to provide a conservative estimate given uncertainty in characterizing water concentrations at the site.

The screening exposure scenario is not realistically representative for mobile aquatic and benthic organisms such as fish and crustaceans, which may use the entire offshore area. Also, the screening exposure scenario focuses only on the highest concentrations within the offshore area, and does not represent population-wide exposures, that are the focus of ERA (USEPA 1997b). Therefore, the reasonable maximum exposure scenario is also assessed. In this scenario, the EPC reflects a conservative estimation of the central tendency of the data as discussed in Section 3.3.

Several classes of organic chemicals assessed for aquatic and benthic organisms share a common mode of exposure and/or toxicity. For example, chemical analytical data are available for a range of PCB congeners. While each congener is a different chemical, they produce the same types of effects and share similar patterns of uptake. The same is true for HMW PAHs, LMW PAHs and dioxin congeners. As discussed in Sections 3.3.1 through 3.3.3, concentrations of individual compounds were combined for these chemical classes in sediment and surface water using methodologies specific to their chemical class. TEFs specific to fish were used for dioxins (Van Den Berg et al. 2006).

4.1.2 Toxicity Assessment

To assess the potential impact on aquatic and benthic organisms from exposures to chemicals in sediment and surface water, benchmarks are compiled from guidance and the scientific literature. Therefore, these benchmarks are considered protective comparison values for aquatic and benthic organisms and are referred to as Toxicity Reference Values (TRVs). Two types of TRVs were considered. The first group, referred to as Threshold Effects Levels (TELs), are benchmarks that represent concentrations corresponding to either no toxicological effect or a

very low toxicological effect of chemicals on aquatic and benthic organisms. As discussed further below, these TEL TRVs are considered precautionary. The second type, referred to as Probable Effects Levels (PELs), are values above which effects are probable. These benchmarks are considered a strong indicator that there is risk.

TRVs for comparison against sediment concentrations are derived from a number of sources. TELs and PELs for coastal sediments derived by MacDonald et al. (1996), and reported in Buchman (2008), are employed as TRVs. Effects Range − Low (ER-L) and Effects Range − Medium (ER-M) values reported in Long et al. (1995) and Long and Morgan (1990) are used in the absence of TELs and PELs. Where these avlues are unavailabIn the absence of these TRVs, the lowest value is chosen from sediment quality benchmark (SQB) values in Jones et al. (1997), ecotoxicological threshold (ET) values from USEPA (1996), and Washington State sediment quality standards (SQS) from Jones et al. (1997). If TRVs are not available from these sources, sources are sought from scientific literature and other guidance (OMEE 1993, DiToro et al. 2000). TRVs for sediment are presented in **Table 4.2**. Threshold level TRVs are unavailable for cyanide and two metals and PEL TRVs are unavailable for cyanide, five metals, tributyltin, and volatiles; uncertainty associated with the lack of TRVs is discussed in Section 4.3.

For comparisons involving surface water, National Recommended Water Quality Criteria (NRWQC) developed by USEPA (2009a) for the protection of aquatic life are used as TRVs. These values are developed to be protective of a broad range of taxa, feeding habits, and life stages of aquatic receptors. When a chronic or acute NRWQC is not available for a particular chemical, the Tier II chronic value from Suter and Tsao (1996) is used as the TRV. These values are also highly conservative. TRVs for surface water are presented in **Table 4.3**. It is important to note that benchmarks for metals are usually established for dissolved concentrations, rather than total concentrations in water; only total surface water concentrations are available for the risk assessment.

It is also important to note that TRVs derived from these sources are highly precautionary. They are typically developed to be protective of highly sensitive organisms, and are often based on studies using highly bioavailable or toxic forms of chemicals in laboratory bioaccumulation tests. As such, these TRVs are not necessarily reflective of conditions specific to Coke Point, and may overestimate risks. As discussed in the CSM (Chapter 2), chemical conditions in sediment may decrease the toxicity of metals through formation of sulfides and insoluble chemical compounds. The precautionary nature of benchmarks is a source of uncertainty discussed further in Section 4.3.

4.1.3 Measurement Endpoint: Comparisons to Sediment TRVs

The first measurement endpoint evaluated is comparison of sediment EPCs to TEL and PEL TRVs protective of benthic organisms. EPCs are divided by TRVs to produce a Hazard Quotient (HQ). If the HQ is greater than or equal to 1, it means that the EPC is greater than or equal to the TRV, and that there is a potential for risks. If the HQ is less than 1, it means that the EPC is less than the TRV, and that there is no expected potential for risks. Comparisons and HQs for sediment are presented in **Table 4.4**.

4.1.3.1 Screening Exposure Scenario

When screening exposure scenario EPCs are compared to sediment TEL TRVs for aquatic and benthic organisms, 17 metals, total HMW and LMW PAHs, TCDD TEQ, and PCBs exceed TEL TRVs and produce HQs greater than 1. Each chemical for which the screening exposure scenario HQ is greater than or equal to 1 is listed below with the HQ in parentheses. Chemicals with doses also exceeding PELs are bolded with an asterisk:

- Aluminum (1.39)
- Antimony (1.65)
- **Arsenic (9.94)***
- **Cadmium (11.4)***
- **Chromium (9.64)***
- **Cobalt (5.30)***
- **Copper (31.8)***
- **Iron (6.00)***
- **Lead (42.3)***
- **Manganese (3.46)***
- **Mercury (13.1)***
- **Nickel (3.55)***
- Selenium (12.3)
- **Silver (3.84)***
- Tin (58.8)
- Vanadium (2.98)
- **Zinc (22.0)***
- **Total HMW PAH (ND = 0) (440)***
- **Total HMW PAH (ND = DL) (440)***
- **Total LMW PAH (ND = 0) (23,300)***
- **Total LMW PAH (ND = DL) (23,300)***
- Total PCBs (ND = 0) (7.70)
- Total PCBs (ND = DL) (8.17)
- **TCDD TEQ (ND = DL) (51.4)***

The fact that maximum concentrations of these chemicals exceed TEL TRVs indicates that there is a potential for risks to aquatic and benthic organisms. Exceedence of PEL TRVs in addition to TELs represents a more certain potential for risk. Comparison of the screening EPC to TRVs is precautionary, and results should be evaluated in light of the additional measurement endpoints listed below.

4.1.3.2 Reasonable Maximum Exposure Scenario

Because some aquatic and benthic organisms are mobile, and because the screening EPC may represent exposures for only a small portion of the aquatic and benthic organism community as a whole, reasonable maximum exposure scenarios are evaluated using reasonable maximum exposure scenario EPCs. When reasonable maximum exposure scenario EPCs are compared to TRVs for aquatic and benthic organisms, 16 metals, total HMW and LMW PAHs, TCDD TEQ, and PCBs exceed TEL TRVs and produce HQs greater than 1 (**Table 4.4**). Each chemical for which the screening exposure scenario HQ are greater than or equal to 1 is listed below with the HQ in parentheses.

Chemicals with doses also exceeding PELs are bolded with an asterisk:

- Aluminum (1.23)
- Arsenic (3.82)
- Cadmium (4.39)
- **Chromium (4.52)***
- Cobalt (2.94)
- **Copper (9.20)***
- **Iron (3.82)***
- **Lead (11.6)***
- **Manganese (2.76)***
- Mercury (5.28)
- Nickel (2.68)
- Selenium (4.61)
- Silver (1.90)
- Tin (25.1)
- Vanadium (2.04)
- **Zinc (8.06)***
- **Total HMW PAH (ND = 0) (132)***
- **Total HMW PAH (ND = DL) (132)***
- **Total LMW PAH (ND = 0) (7,050)***
- **Total LMW PAH (ND = DL) (7,050)***
- Total PCBs (ND = 0) (3.01)
- Total PCBs (ND = DL) (4.43)
- TCDD TEQ (ND = DL) (20.2)

Antimony is the only chemical which exceeds under screening exposure scenarios that does not exceed under reasonable maximum exposure scenario. The fact that reasonable maximum exposure scenario concentrations of the above chemicals exceed TRVs indicates that elevated concentrations of these chemicals produce a potential for risks to aquatic and benthic organisms.

It is important to note that high risks to benthos from LMW PAHs in sediments are driven almost entirely by a single high detection of naphthalene at sample location BH-SED-03B. This indicates that risks from this chemical are driven primarily by this location.

4.1.4 Measurement Endpoint: Comparisons to Sediment Background

Comparison of EPCs to TRVs provides a valid assessment of the potential for risk to aquatic and benthic organisms. However, TRVs are precautionary, and such comparisons do not provide any information regarding whether potential risks are due to source-related chemicals or chemicals which occur ubiquitously in the Patapsco River due to point and non-point sources related to Coke Point.

Therefore, HQs for sediments in the Coke Point Offshore Area are compared to those for sediments in the Patapsco River Background Area as another measurement endpoint (**Table 4.4**). This serves several purposes. First, TRVs may not reflect site-specific chemical conditions; they are typically designed to be highly precautionary and are based on forms of chemicals that may not be found offshore. Also, natural or widespread chemicals may vary in overall concentration from region to region; natural communities adapt over time to widespread chemical conditions. Therefore, comparisons to background provide an indication of whether TRVs are likely to overestimate risks. Second, comparison to background indicates whether potential risks around Coke Point are source-related, or if they represent background risks due to regionally elevated concentrations of chemicals.

4.1.4.1 Background Exceedence of TRVs

For the Patapsco River Background Area, maximum sediment EPCs for 16 metals, dioxins, total HMW and LMW PAHs exceed TEL TRVs under screening exposure scenarios. Five metals (chromium, iron, lead, manganese, and zinc) and total HMW and LMW PAHs exceed PEL TRVs. This may indicate that TRVs are precautionary, or that there are regionally elevated concentrations of chemicals from chemical sources other than Coke Point.

However, hazard quotients for all chemicals are higher for the Coke Point Offshore Area than for the Patapsco River Background Area under the reasonable maxiumum scenario. and only a few chemicals in the Patapsco River (TCDD TEQ, cobalt, manganese, and tin) demonstrate reasonable maximum background EPCs exceeding benchmarks. Three metals (chromium, manganese, and zinc), HMW PAHs, and LMW PAHs have reasonable maximum background EPC concentrations that exceed PEL TRVs in the background area. This indicates greater potential for risks from Coke Point.

4.1.4.2 Comparison of Offshore Area Concentrations to Background

For the Coke Point Offshore Area, sediment concentrations of 17 metals, total HMW and LMW PAHs, TCDD TEQ, and total PCBs exceed TEL TRVs. HQs for all of these chemicals are greater around the Coke Point Offshore Area than those for the Patapsco River Background Area. Screening level Coke Point HQs for metals range from approximately one to more than 10 times higher than background HQs, while reasonable maximum exposure scenario HQs are up to 3 times higher (**Table 4.4**). Of particular note are lead and mercury, for which reasonable maximum HQs are at least three times higher than background.

Coke Point HQs for total HMW PAHs and LMW PAHs are at least an order of magnitude above background HQs for the screening exposure scenario, and for the reasonable maximum exposure scenario. Screening scenario HQs are 8 times background for total PCBs; reasonable maximum exposure scenario HQs are 5 times background for total PCBs. For TCDD TEQ, reasonable maximum scenario HQs are around 2 times background.

Alternative treatments of background data have been analyzed and are documented as part of the Sensitivity Analysis presented in **Appendix G**, which documents that more precautionary treatment of background data produces greater differences between risk estimates in the Coke Point Offshore Area and Patapsco River Background Area.

These results indicate that elevated chemical concentrations in the Coke Point Offshore Area cause potential for risk that cannot be attributed to background concentrations in the Patapsco River. Relative risk from sediments is highest for organic chemicals (PAHs, PCBs, and dioxins as TCDD TEQs) and several metals (arsenic, cadmium, chromium, copper, lead, mercury, selenium silver, tin, and zinc).

4.1.5 Measurement Endpoint: Comparisons to Surface Water TRVs

The primary exposure medium for many free swimming aquatic organisms is surface water. Therefore, comparison of surface water EPCs to TRVs protective of aquatic organisms is evaluated as a measurement endpoint. EPCs are divided by TRVs to produce an HQ. If the HQ is greater than or equal to 1, it means that the EPC is greater than or equal to the TRV, and that there is a potential for risks. If the HQ is less than 1, it means that the EPC is less than the TRV, and that there is no expected potential for risks. Comparisons and HQs for surface water are presented in **Table 4.5**.

4.1.5.1 Screening Exposure Scenario

When screening exposure scenario EPCs are compared to surface water TRVs for aquatic and benthic organisms, three metals, 2 VOCs, and total HMW and LMW PAHs exceed TRVs and produce HQs greater than 1. Each chemical for which the screening exposure scenario HQ is greater than or equal to 1 is listed below with the HQ in parentheses:

- Aluminum (1.04)
- Manganese (1.65)
- Zinc (1.04)
- Ethylbenzene (5.48)
- Toluene (1.53)
- Total HMW PAH (ND = 0) (5,420)
- Total HMW PAH (ND = DL) (5,420)
- Total LMW PAH (ND = 0) (3.85)
- Total LMW PAH (ND = DL) (3.85)

The fact that maximum concentrations of these chemicals exceed surface water TRVs indicates that concentrations of these chemicals may be occasionally elevated in surface water and produce a potential for risk to aquatic and benthic organisms. Comparison of the screening EPC to TRVs is precautionary, and results should be evaluated in light of the additional measurement endpoints listed below.

4.1.5.2 Reasonable Maximum Exposure Scenario

Because some aquatic and benthic organisms are mobile, and because the water column undergoes frequent mixing, the reasonable screening EPC may better represent exposures for the aquatic and benthic organism community as a whole. Reasonable maximum exposure scenarios are evaluated using reasonable maximum exposure scenario EPCs. When reasonable maximum exposure scenario EPCs are compared to TRVs for aquatic and benthic organisms, total HMW PAHs exceed TRVs and produce HQs greater than 1 (**Table 4.5**).

Each chemical for which the screening exposure scenario HQs are greater than or equal to 1 is listed below with the HQ in parentheses:

- Total HMW PAH (ND = 0) (750)
- Total HMW PAH (ND = DL) (438)
- Total LMW PAH (ND = 0) (1.05)
- Total LMW PAH (ND = DL) (1.08)

The fact that reasonable screening EPCs for aluminum, manganese, zinc, ethylbenzene, and toluene do not exceed TRVs indicates that these chemicals are unlikely to produce risks. Total

HMW and LMW PAHs exceed TRVs, indicating that elevated concentrations of these chemicals may produce a potential for risk to aquatic and benthic organisms.

4.1.6 Measurement Endpoint: Comparisons to Surface Water Background

HQs for surface water exposures in the Coke Point Offshore Area are compared to those for surface water exposures in the Patapsco River Background Area as another measurement endpoint (**Table 4.5**). As discussed above, this provides a useful indication of whether TRVs are relevant to evaluate regional exposures, and an indication of the source-relatedness of potential risks.

For the Coke Point Offshore Area, surface water concentrations of three metals, two VOCs, and total HMW PAHs exceed TRVs. For the Patapsco River Background Area, screening level surface water EPCs for aluminum (HQ of 1.2) and total HMW PAHs exceed TRVs (**Table 4.5**). HQs for aluminum for the Coke Point Offshore Area were relatively similar to HQs for the Patapsco River Background Area (**Table 4.5**). Screening exposure Coke Point HQs for VOCs, manganese and zinc are higher than background HQs, but reasonable maximum exposure scenario HQs did not exceed 1. Coke Point HQs for total PAHs are several orders of magnitude above background HQs for the screening and reasonable maximum exposure scenarios. In the background reasonable maximum scenario, total HMW PAHs exceed TRVs. Overall exceedences are driven primarily by a small number of detections of high concentrations. These results indicate that elevated metal concentrations in the Coke Point Offshore Area in surface water either do not cause a potential for risk or are relatively similar to those in background areas. However, total HMW PAHs in several cases cause potentials for risk that cannot be attributed to background concentrations in the Patapsco River.

4.1.7 Measurement Endpoint: Evaluation of Bioavailability

Evaluation of bioavailability information for the offshore area is included as a measurement endpoint because, as discussed above, TRVs may overestimate risks because they do not incorporate consideration of site-specific bioavailability. This is especially true of metals in anaerobic sediments where chemically reducing conditions favor the binding of metals in sulfide compounds which are relatively non-bioavailable and non-toxic. It is also true for organic compounds that may bind to organic carbon or fine grained sediments. Several sources of data are available to evaluate site-specific bioavailability.

4.1.7.1 Simultaneously Extracted Metals (SEM)/Acid Volatile Sulfides (AVS)

One measure of the potential for metals to bind in sediments and become less bioavailable is the ratio of simultaneously extracted metals (SEM) to acid volatile sulfides (AVS). In reduced, anoxic systems, many metals bind to sulfides and become non-bioavailable. As a general guideline, SEM/AVS ratios of less than 1.0 are an indicator that metals are bound and unlikely to be bioavailable to organisms (USEPA 2005a). SEM/AVS ratios are measured for five sediment samples (S-B1 through S-B5) around Coke Point (EA 2003). The SEM/AVS ratio in these sediments ranged from 0.076 to 0.46. This provides an indication that metals are likely to be bound in sulfide compounds that reduce their bioavailability and toxicity.

4.1.7.2 Laboratory Bioaccumulation Tests

Another way to evaluate the bioavailability of compounds in Coke Point sediment is to expose test organisms to the sediments and then analyze their tissue to determine if uptake has occurred. Such a study was conducted using Coke Point sediments with known concentrations of metals, PAHs, and PCBs and is presented in **Appendix H**. Composite sediment samples were collected from the Coke Point Offshore Area and Sollers Point within the Patapsco River background area. Sediment was used in 28-day laboratory bioaccumulation tests in which clams and worms were exposed to sediment in a controlled laboratory environment. At the end of the exposure period, tissues were analyzed for lipids, metals, PAHs, and PCBs. The resulting concentration data were analyzed statistically to provide descriptive statistics and perform comparison between pre-test and post-test tissue concentrations. The statistical results indicated that most metals, PAHs, and PCB congeners are bioavailable, as evidenced by uptake into clam and worm tissues compared to pre-test tissues. Statistical comparisons also show that concentrations of 9 metals, 12 PAHs, and 9 PCB congeners were statistically significantly higher in organism tissue exposed to Coke Point sediment than in organism tissue exposed to Sollers Point sediment in the Patapsco River Background Area. Concentrations of metals in tissue were typically less than 1 percent of sediment concentrations on a wet weight tissue to dry weight sediment basis. A few metals had higher percentages between 1 and 6 percent. Percentages for PAHs and PCBs were higher, with several PAHs and PCBs found at wet weight concentrations in tissue of 10 to 35 percent of the concentration in sediment.

This is a strong indication that the Coke Point Offshore Area contributes increased levels of chemicals to the aquatic food chain compared to other nearby areas of the Patapsco River. Based on these results, it is evident that metals, PAHs, and PCBs are bioavailable in Coke Point Offshore Area sediments.

4.1.7.3 Field-Collected Fish and Crab Tissue

Another way to evaluate the bioavailability of compounds is to collect aquatic organisms from the site of potential exposure (Coke Point Offshore Area) and compare concentrations of chemicals in their tissues to concentrations from organisms collected in other areas (Patapsco River Background Area).

Such a study was conducted at Coke Point as presented in **Appendix H**. Field collection of tissue included collection of white perch (*Morone americana*) and blue crabs (*Callinectes sapidus*) from the Coke Point Offshore Area and Sollers Point in the Patapsco River Background Area. Specimens were collected and processed to create composites consisting of tissue from several individual organisms. Separate analyses of lipids, metals, PAHs, and PCBs were performed on whole body fish tissue, fish filets, crab meat, and crab digestive gland (mustard). . Concentration data were analyzed statistically to provide descriptive statistics, perform comparison between the two areas, and create crab and fish EPCs for use in the risk assessment.

Analysis of field-collected tissue indicates that metals, PAHs, and PCBs are present in whole body fish and crab tissues. Fish filets contain fewer and lower concentrations of chemicals. Statistical comparisons show that concentrations of metals, PAHs, and PCB congeners were

statistically significantly higher in crab mustard from Coke Point compared to mustard from the background area. Metals and PAHs were higher in total edible crab tissue. Only metals were statistically significantly higher in fish tissue. This is a strong indication that the Coke Point Offshore Area contributes increased levels of chemicals to game species in the aquatic food chain compared to other nearby areas of the Patapsco River.

4.1.8 Risk Characterization for Aquatic and Benthic Organisms

The risk characterization of aquatic and benthic organisms draws from five measurement endpoints to obtain conclusions regarding the potential for risks. The results for each measurement endpoint are discussed and weighed as evidence to determine whether chemicals in the Coke Point Offshore Area are expected to pose potential risk to aquatic and benthic organisms.

Comparisons of offshore area chemical concentrations to TRVs were used as an indicator of potential risks. Comparison of sediment concentrations to sediment TRVs protective of aquatic life identifies 17 metals, TCDD TEQ, total HMW and LMW PAHs, and PCBs whose screening EPC exceeds TRV. Almost as many compounds exceed TRVs for the reasonable maximum exposure scenario. Comparisons of offshore area risks to background risks are conducted as another measurement endpoint. These comparisons indicate that chemical concentrations in sediments in the Coke Point Offshore Area cause potential for risk that cannot be attributed to background concentrations in the Patapsco River. Arsenic, cadmium chromium, copper, lead, mercury, zinc, HMW PAHs, LMW PAHs, and PCBs are identified as special concerns because their maximum EPCs are elevated approximately 10 times background concentrations or more and they also exceed PELs. Measures of chemical bioavailability in sediment indicate that metals, PAHs, and PCBs are bioavailable, but that metal bioavailability may be overestimated.

The assessment also considers chemical concentrations in surface water using TRV and background comparisons as measurement endpoints. Reasonable maximum case scenarios of LMW and HMW PAHs exceed surface water benchmarks.

4.2 ASSESSMENT OF RISKS TO WILDLIFE

The CSM for Coke Point in Chapter 2 identifies the viability of wildlife, including birds and mammals, as an assessment endpoint for evaluation. Great blue heron, osprey, raccoon, and river otter are selected as specific representative receptor species.

Because wildlife may be exposed to multiple media via the food chain, measurement endpoints for wildlife are based on food web modeling to estimate ingested doses (**Table 4.1**). Measurement endpoints evaluated for wildlife include comparisons of doses in prey, sediment, and surface water to toxicological benchmarks; comparison of offshore area doses of chemicals to background doses; qualitative consideration of factors affecting bioavailability and qualitative consideration of habitat quality. Exposure and toxicity assessments are presented below to support evaluation of these measurement endpoints.

4.2.1 Exposure Assessment

As discussed in the CSM (Chapter 2), the primary route of exposure for wildlife to chemicals in sediment and surface water is through the food chain. Wildlife may be exposed to chemicals in sediment and surface water through direct ingestion. They also may be exposed to chemicals in sediment and surface water through ingestion of prey items (i.e., benthic organisms, crabs, and fish) that have accumulated chemicals from these media. Food web modeling is performed to estimate combined exposures from these pathways. EPCs for sediment, surface water, and prey item tissue (**Tables 3.4** through **3.7**) are combined with data concerning ingestion rates to estimate a dose to each receptor.

This section presents the methods used to quantify the potential exposure of wildlife to chemicals via the ingestion of food, surface water, and sediment. The methods are derived based on equations presented in USEPA (1993) and Sample et al. (1996). The equations and exposure parameters discussed below are consistent with USEPA (1997b) guidance and standard risk assessment practice. All chemicals detected in sediment and surface water are evaluated in the exposure models. Concentrations of these chemicals within other media to which a receptor could be exposed are then also considered for evaluation. Wildlife exposure factors are presented in **Table 4.6**; food web dose model calculations for the Offshore area and background for each receptor species are presented in **Appendix C** and sample exposure calculations are presented in **Appendix F**. Dose-based TRVs for birds and mammals are presented in **Tables 4.7** and **4.8**, respectively.

It should be noted that, in general, conservative assumptions are used in the food web models. The objective of the models is to provide an upper bound risk estimate. Accordingly, in almost all cases, actual risks are likely to be overestimated by the models. Uncertainties associated with precautionary assumptions and other exposure estimation factors are discussed in Section 4.3.

4.2.1.1 Exposure Point Concentrations

To represent wildlife exposures to chemicals in sediment, surface water, and prey items, two scenarios are evaluated as representative of potential exposures. Both screening and reasonable maximum exposure scenario EPCs for all media are used in exposure models. The screening exposure scenario is included to provide a precautionary bound, but the reasonable maximum exposure scenario is considered most representative of exposures for wildlife because birds and mammals may range over the entire offshore area, contacting exposure media in multiple locations and consuming organisms that have similarly utilized many portions of the offshore area. As discussed in Section 3.3, the 95%UCLM is used as a precautionary estimate of mean exposures over time, with the maximum detected concentration used as the reasonable screening EPC when there are too few samples to calculate a 95%UCLM.

As discussed in Section 3.3, concentrations of metals, PAHs, and PCBs in the tissue of prey items were derived from site-specific laboratory bioaccumulation studies and field-collected tissue (**Appendix H**). Site-specific BAFs are available from bioaccumulation studies to estimate uptake of chemicals from sediment into benthos such as clams and worms. EPCs based on these BAFs are most representative of tissue concentrations in lower trophic level prey. Site-specific

tissue EPCs are also available for chemical concentrations in whole body fish and total crab tissue from field-collected specimens. These EPCs are most representative of tissue concentrations in higher trophic level prey. Therefore, the ERA evaluates separate food web model scenarios for uptake from benthos, crabs, and fish. Data inputs to each scenario are detailed in **Table 3.2**. EPCs are presented in **Tables 3.4** through **3.7**. Tissue EPCs for dioxins, metals, organotins, and VOCs in aquatic and benthic organisms are derived from sediment and surface water concentrations using literature-based BAFs. BAFs are developed to separately model accumulation of chemicals into prey item tissues from sediment and surface water.

As discussed for aquatic and benthic organisms, several classes of organic chemicals (PAHs, PCBs, and dioxins and furans) share a common mode of exposure and/or toxicity and concentrations were summed as discussed in Sections 3.3.1 through 3.3.3. However, in some cases, exposure estimates for these chemical classes are handled differently for wildlife than for aquatic and benthic organisms.

- **PAHs** – For wildlife, uptake of each PAH compound through the food chain may vary. However, LMW PAHs share common toxicity and HMW PAHs share common toxicity. Benchmarks from guidance define toxicity in terms of these groupings (USEPA 2007f). Therefore, screening and reasonable maximum EPCs for each individual PAH are entered into food web models, and doses calculated using chemical-specific uptake factors. After models are run for each compound, doses are summed to calculate the total doses of LMW PAHs and HMW PAHs for both screening and reasonable maximum exposure scenarios. These doses are then compared to benchmarks. Because EPC statistics for individual PAHs utilize the reporting limit to represent non-detects, doses of total LMW and HMW PAH assume non-detects are represented by reporting limits. LMW PAHs include 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, naphthalene, and phenanthrene while HMW PAHs include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene.
- **PCBs** – USEPA guidance has identified a standard method for using congener-specific data to estimate the total concentration of PCBs (Van den Berg et al. 1998). Per this method, the concentrations of 18 specific congeners are summed and then the sums doubled for each sample. Because guidance defines PCB toxicity in terms of a total PCB estimate, EPCs for total PCBs are entered into food web models, and general, precautionary uptake factors used to calculate a total PCB dose.
- **Dioxins and Furans** – As for PAHs, uptake through the food chain of each dioxin and furan may vary. However, guidance indicates that toxicity of dioxins and furans is best evaluated for birds and mammals using TCDD TEQs (Van den Berg et al. 1998, 2006). Therefore, the screening and reasonable maximum exposure scenario EPCs for each dioxins and furan congener are entered into food web models, and their uptake through the food web modeled separately. The dose of each congener is then multiplied by congener-specific TEFs for birds and mammals (Van den Berg et al. 1998, 2006) relating toxicity for the congener to that of TCDD. These adjusted doses are summed to produce

a dioxin TCDD TEQ dose that could be compared to the TRV for TCDD. Because concentrations for individual dioxins utilize only the reporting limit to represent non-detects, the TCDD TEQ value uses reporting limits to represent non-detects in statistical calculation of EPCs. It is noted that neither laboratory bioaccumulation tests nor field-collected tissue data were available for dioxins; therefore, literature-based uptake factors were used to calculate tissue concentrations for all scenarios.

4.2.1.2 Ingestion of Chemicals from Abiotic Media

As discussed in the conceptual model (Section 2.4.3), terrestrial wildlife may ingest sediment while foraging or grooming. Therefore, food web models account for incidental ingestion of sediment. Based on their foraging and habitat characteristics, it is assumed for the purposes of the models that great blue heron, osprey, raccoon, and river otter would be exposed to sediment.

The following equation is used to calculate the dose of chemical piscivorous wildlife would obtain from the ingestion of sediment ($Dose_{sed}$, mg/kg):

$$\boxed{Dose_{sed} = SI * C_{sed}}$$

Where:

$Dose_{sed}$	=	amount of chemical ingested per day from sediment [milligrams per kilogram body weight per day (mg/kg bw-day)];
SI	=	sediment ingestion rate [kilograms per kilogram body weight per day (kg/kg bw-d) on a dry weight basis]; and
C_{sed}	=	chemical concentration in surface sediment (mg/kg dry weight)

Percent sediment ingestion values taken from the scientific literature for the terrestrial wildlife species of concern are multiplied by the food ingestion rates (FI) for these species to estimate sediment ingestion rates (SIs). A summary of the percent sediment ingestion rates and food ingestion rates taken from the scientific literature is presented in **Table 4.6**.

Exposures to surface water are calculated in a manner similar to those in sediment by multiplying the daily drinking water ingestion rate by the concentrations of chemicals in surface water. The following equation is used to calculate the upper bound dose of chemical that terrestrial wildlife could obtain from the ingestion of surface water:

$$Dose_{sw} = WI * C_{sw}$$

Where:

$Dose_{sw}$	=	amount of chemical ingested per day from surface water (mg/kg bw-day);
WI	=	surface water ingestion rate [liters per kilogram body weight per day (L/kg bw-d)];
C_{sw}	=	maximum chemical concentration in surface water (mg/kg).

4.2.1.3 Ingestion of Chemicals from Food

The following equation is used to calculate the dose of chemicals that a terrestrial wildlife species could obtain from the ingestion of food ($Dose_{food/prey}$, mg/kg bw-day):

$$Dose_{prey} = FI * C_{org}$$

Where:

FI	=	food ingestion rate (kg/kg bw-d on a wet weight basis);
C_{org}	=	estimated maximum concentration of chemical in food/prey (mg/kg wet weight).

A summary of the FIs used in the Baseline ERA for each of the wildlife species selected for evaluation is presented in **Table 4.6**. As discussed above, separate scenarios are run to model ingestion of lower trophic level benthos (e.g. clams and worms), higher trophic level benthos (crabs) and higher trophic level fish.

4.2.2 Total Chemical Ingestion

The total dietary exposure doses for piscivorous birds (heron and osprey) and piscivorous mammals (raccoon and river otter) ($Dose_{total}$, mg/kg bw-day) for the evaluated chemicals are determined using the following equation:

$$Dose_{total} = Dose_{prey} + Dose_{sed} + Dose_{water}$$

Where:

$Dose_{prey}$	=	amount of chemical ingested per day from prey (mg/kg bw-day);
$Dose_{sed}$	=	amount of chemical ingested per day from sediment (mg/kg bw-day);
$Dose_{water}$	=	amount of chemical ingested per day from water (mg/kg bw-day);

The total dietary intakes are compared to dietary toxicity values to determine if adverse effects are likely to occur to wildlife from the ingestion of chemicals in food, sediment and surface water.

4.2.3 Toxicity Assessment

Potential impacts on wildlife are evaluated using dose-based toxicological benchmarks. **Tables 4.7** and **4.8** show the dose based TRVs for birds and mammals, respectively. First, modeled doses are compared to dose-based no-observed-adverse-effect levels (NOAELs). NOAELs are doses that have been shown to cause no adverse impacts in test species. Because NOAELs are precautionary and highly protective, they are used as TRVs in this ERA. The NOAELs used in this ERA are derived, in descending order of preference, from studies by USEPA (USEPA 2003 a-b, 2005 b-j, 2006, 2007 a-f) and by Oak Ridge National Laboratory (Sample et al., 1996). The Oak Ridge National Laboratory NOAELs are generally derived based upon measurements of survival, growth, or reproduction in the laboratory. Values from USEPA Ecological Soil Screening Levels (EcoSSLs) are derived through statistical analyses of results from multiple toxicological studies with multiple endpoints. While the EcoSSLs are developed for soil exposures, the models used to develop these benchmarks include ingestion rates, dose-based toxicity values, and other useful information for use in assessing exposures of the receptors to sediment dwelling organisms (benthos and crabs) in the study.

The second set of benchmarks utilized are lowest-observed-adverse-effect levels (LOAELs). These are doses at which a very low level of adverse effect is observed on individual test organisms. The severity of effects considered "low level" varies based on the study from which LOAELs are derived; in general, they correspond to minor changes in growth or reproduction. LOAELs are useful because there is considerable uncertainty associated with NOAELs. Because NOAELs are associated with no effects in a test study, it is uncertain whether they are close to or far below the threshold value at which effects would first be observed. LOAELs thus serve to bound the range of NOAELs, and the threshold of toxic effects is considered to lie between the NOAEL and the LOAEL. Therefore, LOAELS are also utilized as TRVs. It is often standard practice to focus on NOAEL exceedences in the risk assessment, which is more precautionary, and focus on LOAEL exceedences in risk management and risk reduction. In this risk assessment, exceedence of a NOAEL is considered an indicator of risk, and exceedence of a LOAEL is considered an indicator that the chemical in exceedence is a primary risk driver.

LOAELs for several chemicals are available from studies by Oak Ridge National Laboratory (Sample et al. 1996). When LOAELs are not available from this source or exceeded more reliable NOAELs from USEPA EcoSSL sources, the data provided in USEPA EcoSSL documents are used to derive LOAELs; this is performed for PAHs, arsenic, barium, cobalt, and silver. In all cases, the geometric mean of the bounded LOAELs for growth and reproduction is calculated; this approach is similar to that used for derivation of many EcoSSL NOAELs.

In some cases, TRVs are not available for specific organic chemicals, but TRVs are available for compounds with similar structures and expected biological activity. In these cases, one chemical is used to provide a surrogate for the other. This is a standard risk assessment practice with a sound technical basis in toxicology; however, use of surrogates does introduce uncertainty as discussed in Section 4.3. Specific surrogates are indicated in **Tables 4.7** and **4.8.**

4.2.4 Measurement Endpoint: Comparison of Screening Exposure Scenario Modeled Doses to TRVs

The first measurement endpoint evaluated is a comparison of modeled doses based on screening EPCs to NOAEL- and LOAEL-based TRVs protective of birds and mammals. Use of screening EPCs is highly precautionary and represents exposures that are limited to areas highest concentrations offshore; this is a relatively unrealistic exposure scenario for wildlife such as heron, osprey, raccoon, and river otter, which may have home ranges of several hundred acres or more. However, the measurement endpoint is evaluated as a precaution.

Doses are calculated based on direct ingestion of sediment, ingestion of surface water, and ingestion of aquatic organisms as food (**Appendix C**). Screening scenario doses are presented side-by-side with both NOAEL and LOAEL TRVs in **Tables 4.9** and **4.10** for birds and **Tables 4.11** and **4.12** for mammals. These tables include one set of results assuming prey uptake of chemicals from benthic organisms, one set of results assuming uptake from crab, and one set of results assuming prey uptake from fish. Chemicals with doses exceeding their NOAEL-based HQs are listed below. Chemicals with doses also exceeding LOAELs are bolded with an asterisk.

Chemicals with screening scenario doses exceeding for Great Blue Heron

Prey: Benthos

- Lead (1.22)
- Vanadium (5.26)
- Total HMW PAH (ND = DL) (2.68)
- **Total LMW PAH (ND = DL) (11.4)***
- Total PCBs (ND = 0) (2.92)
- Total PCBs (ND = DL) (3.38)

Prey: Crabs

- Total LMW PAH (ND = DL) (2.00)

Prey: Fish

- Copper (1.65)
- Selenium (1.16)
- Total LMW PAH (ND = DL) (1.99)

Chemicals with screening scenario doses exceeding TRVs for Osprey

Prey: Benthos

- Lead (1.42)
- Vanadium (6.13)
- Total HMW PAH (ND = DL) (3.12)
- **Total LMW PAH (ND = DL) (13.3)***
- Total PCBs (ND = 0) (3.41)
- Total PCBs (ND = DL) (3.94)

Prey: Crabs

- Total LMW PAH (ND = DL) (2.33)

Prey: Fish

- Copper (1.92)
- Selenium (1.35)
- Total LMW PAH (ND = DL) (2.33)

Chemicals with screening scenario doses exceeding TRVs for Raccoon

Prey: Benthos

Aluminum (79.6)*
Antimony (1.39)
Arsenic (2.78)*
Chromium (1.38)
Lead (1.60)
Selenium (3.37)*
Thallium (1.70)
Vanadium (1.64)
Total HMW PAH (ND = DL) (55.4)*
Total LMW PAH (ND = DL) (2.21)
Total PCBs (ND = 0) (212)*
Total PCBs (ND = DL) (255)*
TCDD TEQ (ND = DL) (3.69)

Prey: Crabs

Aluminum (46.8)*
Arsenic (1.05)
Copper (1.88)
Selenium (5.42)*
Total HMW PAH (ND = DL) (2.11)
Total PCBs (ND = 0) (11.1)*
Total PCBs (ND = DL) (16.0)*

Prey: Fish

Aluminum (55.6)*
Antimony (1.15)
Copper (4.50)*
Lead (1.04)
Selenium (8.87)*
Thallium (1.32)
Total HMW PAH (ND = DL) (2.02)
Total PCBs (ND = 0) (40.7)*
Total PCBs (ND = DL) (42.3)*

Chemicals with screening scenario doses exceeding TRVs for Otter

Prey: Benthos

- **Aluminum (74.9)***
- Antimony (1.31)
- **Arsenic (2.62)***
- Chromium (1.30)
- Lead (1.50)
- **Selenium (3.18)***
- Thallium (1.60)
- Vanadium (1.55)
- **Total HMW PAH (ND = DL) (52.1)***
- Total LMW PAH (ND = DL) (2.08)
- **Total PCBs (ND = 0) (208)***
- **Total PCBs (ND = DL) (240)***
- TCDD TEQ (ND = DL) (3.47)

Prey: Crabs

- **Aluminum (44.0)***
- Copper (1.77)
- **Selenium (5.10)***
- Total HMW PAH (ND = DL) (1.99)
- **Total PCBs (ND = 0) (10.4)***
- **Total PCBs (ND = DL) (15.1)***

Prey: Fish

- **Aluminum (52.3)***
- Antimony (1.08)
- **Copper (4.24)***
- **Selenium (8.35)***
- Thallium (1.25)
- Total HMW PAH (ND = DL) (1.90)
- **Total PCBs (ND = 0) (38.3)***
- **Total PCBs (ND = DL) (39.8)***

When screening exposure scenario doses are compared to benchmarks, nine metals, d, total PCBs, total HMW PAHs, and total LMW PAHs exceed NOAEL-based TRVs for either heron, osprey, raccoon, or otter under one of the three prey uptake scenarios. Doses exceeded TRVs most often for scenarios assuming prey uptake from benthic organisms. They exceeded more often for mammals than for birds.

When LOAEL TRVs are considered, doses for four metals, total PCBs, total HMW PAHs, and total LMW PAHs exceed. These four metals are aluminum, arsenic, copper, and selenium.

Results for this measurement endpoint indicate that these chemicals may cause a potential for risk at locations where chemical concentrations are highest. Fewer chemicals pose a potential for risk in scenarios based on uptake from fish and crabs than in scenarios based on uptake from benthic organisms. Given the highly precautionary nature of this measurement endpoint, it must be interpreted in light of results for other endpoints and given a relatively low weight of evidence.

4.2.5 Measurement Endpoint: Comparison of Reasonable Maximum Exposure Scenario Modeled Doses to TRVs

The second measurement endpoint evaluated is a comparison of modeled doses based on reasonable maximum EPCs to NOAEL- and LOAEL-based TRVs protective of birds and mammals. Use of reasonable maximum EPCs is more realistic for wildlife and provides the most representative results for exposures experienced by wildlife populations.

Doses are calculated based on direct ingestion of sediment, ingestion of surface water, and ingestion of aquatic organisms as food. Reasonable maximum exposure scenario doses are presented side-by-side with both NOAEL and LOAEL TRVs in **Tables 4.13** and **4.14** for birds and **Tables 4.15** and **4.16** for mammals. These tables include one set of results assuming prey uptake of chemicals from benthic organisms, one set of results assuming uptake from crab, and one set of results assuming prey uptake from fish. Chemicals with H exceeding their NOAEL-based HQs are listed below. Chemicals with doses also exceeding LOAELs are bolded with an asterisk.

Chemicals with reasonable maximum exposure scenario doses exceeding TRVs for Great Blue Heron

Benthos	Crabs	Fish
Vanadium (3.59) Total LMW PAH (ND = DL) (3.25) Total PCBs (ND = 0) (1.14) Total PCBs (ND = DL) (1.83)	None	Copper (1.39) Selenium (1.07)

Chemicals with reasonable maximum exposure scenario doses exceeding TRVs for Osprey

Benthos	Crabs	Fish
• Vanadium (4.19) • Total LMW PAH (ND = DL) (3.79) • Total PCBs (ND = 0) (1.33) • Total PCBs (ND = DL) (2.14)	• None	• Copper (1.63) • Selenium (1.25)

Chemicals with reasonable maximum exposure scenario doses exceeding TRVs for Raccoon

Benthos	Crabs	Fish
TCDD TEQ (ND = DL) (1.46)	**Aluminum (41.3)***	**Aluminum (49.4)***
Aluminum (70.3)*	Copper (1.41)	**Copper (3.81)***
Arsenic (1.07)	**Selenium (4.88)***	**Selenium (8.22)***
Selenium (1.27)	Total PCBs (ND = 0) (10.4)	Thallium (1.13)
Vanadium (1.12)	**Total PCBs (ND = DL) (15.1)***	**Total PCBs (ND = 0) (39.4)***
Total HMW PAH (ND = DL) (13.5)		**Total PCBs (ND = DL) (40.9)***
Total PCBs (ND = 0) (86.4)*		
Total PCBs (ND = DL) (138)*		

Chemicals with reasonable maximum exposure scenario doses exceeding TRVs for Otter

Benthos	Crabs	Fish
• TCDD TEQ (ND = DL) (1.37)	• **Aluminum (38.9)***	• **Aluminum (46.5)***
• **Aluminum (66.2)***	• Copper (1.32)	• **Copper (3.58)***
• Arsenic (1.01)	• **Selenium (4.60)***	• **Selenium (7.74)***
• Selenium (1.19)	• Total PCBs (ND = 0) (9.80)	• Thallium (1.06)
• Vanadium (1.06)	• **Total PCBs (ND = DL) (14.3)***	• **Total PCBs (ND = 0) (37.1)***
• Total HMW PAH (ND = DL) (12.8)		• **Total PCBs (ND = DL) (38.5)***
• **Total PCBs (ND = 0) (81.3)***		
• **Total PCBs (ND = DL) (130)***		

When reasonable maximum exposure scenario doses are compared to benchmarks, six metals, TCDD TEQ, total PCBs, total HMW PAHs, and total LMW PAHs exceed NOAEL-based TRVs for either heron, osprey, raccoon, or otter under one of the three prey uptake scenarios. Doses exceeded TRVs most often for scenarios assuming prey uptake from benthic organisms. They exceeded more often for mammals than for birds. When LOAEL TRVs are considered, doses for three metals and total PCBs exceed. The three metals are aluminum, copper, and selenium.

Results for this measurement endpoint indicate that, based on exceedence of LOAEL TRVs, aluminum, copper, selenium and total PCBs may cause a potential for risks to wildlife in the Coke Point Offshore Area. Additional metals, TCDD TEQ, and total HMW and LMW PAHs could also pose a risk, although to a lesser extent, based on the fact that reasonable maximum exposure scenario doses exceed NOAEL TRVs. Given the highly precautionary nature of TRVs, it is recommended that results for benchmark comparisons be interpreted with consideration of background doses and the role of factors that may affect site-specific bioavailability.

4.2.6 Measurement Endpoint: Comparison of Modeled Doses Offshore Area to Modeled Doses in the Patapsco River Background Area

Doses representing wildlife exposures in the Coke Point Offshore Area are compared to doses for the Patapsco River Background Area as another measurement endpoint. As discussed above, this provides a useful indication of whether TRVs are relevant to regional exposures, and an indication of the source-relatedness of potential risks. Background doses are presented side-by-side with site doses in **Tables 4.9, 4.10, 4.13,** and **4.14** for birds and **Tables 4.11, 4.12, 4.15,** and **4.16** for mammals. It is important to note that the purpose of this risk assessment is to quantitatively evaluate potential risks from exposure to the offshore areas adjacent to the Coke Point Peninsula. Thus risk results based on nearby samples in the Patapsco River are included as comparison values to provide context, and are not intended as a comprehensive characterization of risks across the full reach of the Patapsco River.

For the Patapsco River Background Area, modeled doses for four metals as well as TCDD TEQ, total HMW PAHs, and total PCBs exceeded NOAEL TRVs. The four metals that exceeded NOAEL TRVs are aluminum, copper, selenium, and vanadium. It is important to note that dioxin exceedences were only present in models based on prey bioaccumulation from benthos. Bird scenarios had only three background exceedences, vanadium, which only exceeds for avian bioaccumulation from benthic organisms, and copper and selenium, which only exceed for avian bioaccumulation from fish. Selenium exceeds only under screening level scenarios. Mammals on the other hand, showed background exceedences of NOAEL TRVs for TCDD TEQ and HMW PAHs for prey bioaccumulation from benthos, selenium for prey bioaccumulation from crabs and fish, in addition to aluminum and total PCBs for all three bioaccumulation models.

4.2.6.1 Screening Scenario: Comparison of Offshore Area Concentrations to Background

For those chemicals with screening scenario doses that exceeded NOAELs, doses of nine metals, TCDD TEQs, total PCBs, total HMW PAHs, and total LMW PAHs also exceeded background doses (**Table 4.9, 4.10, 4.11,** and **4.12**). Chemicals with doses exceeding NOAELs are listed below followed by the ratio of the Coke Point Offshore Area HQ to the background HQ. Chemicals with Offshore HQs greater than twice background HQs are bolded. Chemicals with HQs equal to or less than background HQs are italicized.

Ratios of Coke Point Offshore Area Doses to Background Dose for Screening Scenario Doses Exceeding NOAEL TRVs for Piscivorous Wildlife

Avian Receptors : Great Blue Heron and Osprey

Benthos

- **Lead (10.6:1)**
- Vanadium (1.80:1)
- **Total HMW PAH (ND = DL) (44.1:1)**
- **Total LMW PAH (ND = DL) (167:1)**
- **Total PCBs (ND = 0) (10.61:1)**
- **Total PCBs (ND = DL) (8.38:1)**

Crabs

- **Total LMW PAH (ND = DL) (334:1)**

Fish

- Copper (1.41:1)
- Selenium (1.32:1)
- **Total LMW PAH (ND = DL) (314:1)**

Mammalian Receptors: Raccoon and River Otter

Benthos

- **TCDD TEQ (ND = DL) (2.48:1)**
- Aluminum (1.23:1)
- Antimony (1.94:1)
- **Arsenic (4.44:1)**
- **Chromium (2.24:1)**
- **Lead (10.6:1)**
- **Selenium (5.07:1)**
- **Thallium (3.49:1)**
- Vanadium (1.80:1)
- **Total HMW PAH (ND = DL) (44.1:1)**
- **Total LMW PAH (ND = DL) (167:1)**
- **Total PCBs (ND = 0) (10.61:1)**
- **Total PCBs (ND = DL) (8.38:1)**

Crabs

- Aluminum (1.25:1)
- Arsenic (1.20:1)
- *Copper (1:1.09)*
- *Selenium (1:1.00)*
- *Thallium (1:1.60)*
- **Total HMW PAH (ND = DL) (40.6:1)**
- **Total LMW PAH (ND = DL) (334:1)**
- *Total PCBs (ND = 0) (1:1.52)*
- *Total PCBs (ND = DL) (1:1.34)*

Fish

- *Aluminum (1:1.18)*
- Antimony (1.28:1)
- Copper (1.41:1)
- **Lead (7.07:1)**
- Selenium (1.32:1)
- **Thallium (10.2:1)**
- **Total HMW PAH (ND = DL) (42.5:1)**
- Total PCBs (ND = 0) (1.19:1)
- Total PCBs (ND = DL) (1.18:1)

As discussed above, the screening level scenario is provided as a representation of theoretical maximum exposures limited to the area of highest detected concentrations; as such, results for reasonable maximum exposures are more representative for wildlife as presented in Section 4.2.6.2. However, this listing indicates several trends. First, Offshore Area doses are most highly elevated above background doses when ingestion of benthos is assumed. This is because, as documented in laboratory bioaccumulation and field studies (**Appendix H**), clams and worms

tended to accumulate higher concentrations from Coke Point sediments than were observed in field-collected crab or fish.

4.2.6.2 Reasonable Maximum Scenario: Comparison of Offshore Area Concentrations to Background

For those chemicals with reasonable maximum scenario doses that exceeded NOAELs, doses of four metals, TCDD TEQs, total PCBs, total HMW PAHs, and total LMW PAHs also exceeded background doses (**Table 4.13, 4.14, 4.15,** and **4.16**). Chemicals with doses exceeding NOAELs are listed below followed by the ratio of the Coke Point Offshore Area HQ to the background HQ. Chemicals with Offshore HQs greater than twice background HQs are bolded. Chemicals with HQs equal to or less than background HQs are italicized.

Ratios of Coke Point Offshore Area Doses to Background Dose for Reasonable Maximum Scenario Doses Exceeding TRVs for Piscivorous Wildlife

Avian Receptors : Great Blue Heron and Osprey

Benthos	Crabs	Fish
• Vanadium (1.23:1) • **Total LMW PAH (ND = DL) (48.1:1)** • **Total PCBs (ND = 0) (4.57:1)** • **Total PCBs (ND = DL) (4.98:1)**	• No exceedences of NOAELs	• Copper (1.34:1) • Selenium (1.27:1)

Mammalian Receptors: Raccoon and River Otter

Benthos	Crabs	Fish
• TCDD TEQ (ND = DL) (1.04:1) • Aluminum (1.09:1) • **Arsenic (2.58:1)** • Selenium (1.91:1) • Vanadium (1.23:1) • **Total HMW PAH (ND = DL) (11.0:1)** • **Total PCBs (ND = 0) (4.57:1)** • **Total PCBs (ND = DL) (4.98:1)**	• Aluminum (1.11:1) • *Copper (1:1.28)* • *Selenium (1:1.09)* • *Total PCBs (ND = 0) (1:1.51)* • *Total PCBs (ND = DL) (1:1.36)*	• *Aluminum (1:1.22)* • Copper (1.34:1) • Selenium (1.27:1) • **Thallium (8.69:1)** • Total PCBs (ND = 0) (1.13:1) • Total PCBs (ND = DL) (1.14:1)

This listing for the reasonable maximum scenario indicates trends similar to those observed for the screening scenario. As for the screening scenario, Offshore Area doses were most highly elevated above background doses when ingestion of benthos is assumed. HQs for PAHs are higher than those in background, although LMW and HMW PAHs did not exceed NOAELs for scenarios based on crab and fish tissue. The fact that HQs were higher for the Offshore Area still

indicates that risks due to PAHs in the Coke Point Offshore Area are higher than those from PAHs in the Patapsco River Background Area.

While aluminum HQs for otter scenarios were greater than 2 times background, they did not exceed background HQs for heron, osprey, and raccoon scenarios using fish. PCBs and most other metals demonstrated Offshore Area HQs greater than background for scenarios based on ingestion of benthos, but either similar to (within 2 times) or less than background under crab and fish scenarios. In some cases, this is because doses did not exceed NOAELs under crab or fish scenarios (arsenic and vanadium). In others, it is because fish and crab tissue concentrations were lower than that for benthos. This indicates that risks through the food chain from the Coke Point Offshore Area may only be distinguishable from background risks for species that feed on lower trophic level organisms limited to the offshore area. Thallium displays a different trend because thallium HQs were most highly elevated above background for fish ingestion scenarios.

It is important to note that alternative treatments of background data could be used that are more precautionary but potentially valid. These have been analyzed and are documented as part of the sensitivity analysis presented in Appendix G. Less precautionary assumptions would increase the difference between ecological risk estimates for the Coke Point Offshore Area and the Patapsco River Background Area.

4.2.7 Measurement Endpoint: Evaluation of Area Use by Wildlife

The wildlife species evaluated in this risk assessment are highly mobile. Therefore, it is important to consider the size of the area evaluated in the risk assessment in light of home range and feeding habits. The effects of area use patterns on risk estimates are considered both qualitatively and quantitatively. The qualitative evaluation consists of a discussion of wildlife home range, area use factors, and feeding habits as they may affect their level of exposure in the Coke Point Offshore Area. The quantitative evaluation employs area use factors (AUFs) to modify risk estimates. Results for this measurement endpoint are intended for cautious application as part of the weight of evidence presented in the risk assessment because there are a number of uncertainties inherent to application of area use factors.

4.2.7.1 Review of Habitat, Home Range and Feeding Habits

The Coke Point Offshore Area as evaluated in this assessment consists of 500 acres with approximately 2.6 miles of shoreline. Water depths adjacent to the Coke Point Peninsula are typically 2.5 to 6 ft near the shoreline, and drop off to deeper than 10 to 15 ft within 100 ft of the shoreline (GBA 2005). Fisheries studies (EA 2003) and studies conducted to support this assessment (Appendix H) found that fish – specifically white perch and Atlantic silversides - and crabs are present in the vicinity of Coke Point. These fish provide a potential resource for wildlife. However, upland vegetative habitat along the shoreline is relatively sparse.

Home range is defined as the geographic area encompassed by an animal's activities (except migration) over a specified time. The size and spatial attributes of a home range often are defined by foraging activities, but also might depend on the location of specific resources such as dens or nest sites in other areas. An animal might not visit all areas of its home range every day

or even every week, but over longer time periods, it can be expected to visit most of the areas within the home range that contain needed resources such as forage, prey, or protected resting areas (USEPA 1993).

The feeding territory size for great blue herons varies depending on life history. Great blue herons that roost in heronries, that migrate, or that feed opportunistically may feed over many acres to many kilometers (km) (U.S. Geological Survey 1985, USEPA 1993). For more solitary great blue herons, Bayer (1978) found that the home range of a single pair of herons ranges from 1.5 acres in fall to 21 acres in winter. Fifteen to 20 km is the farthest great blue herons regularly travel between foraging areas and colonies (Gibbs et al. 1987; Gibbs 1991; Peifer 1979). The osprey's foraging radius depends on the availability of appropriate nest sites near areas with sufficient fish. Ospreys have been known to travel up to 10 to 15 km to obtain food but often have a range between 3 and 8 km (740 to 1,980 acres) (Van Daele and Van Daele 1982). Great blue heron feed in shallow areas and thus would only be exposed to environmental media along the shoreline of Coke Point. This is most representative of wading birds such as other herons. Because osprey feed across open water, they would be exposed to media across the entire Coke Point Offshore Area. They are thus most representative of other surface feeding and diving piscivorous birds such as gulls and cormorants.

The size of a raccoon's home range depends on its sex and age, habitat, food sources, and the season. USEPA guidance provides home range estimates for raccoons in riparian and coastal habitats that range from 96 to 504 acres (USEPA 1993). The river otter's home range encompasses the area needed for foraging and reproduction and can range from 400 to 1,900 hectare (990 to 4,700 acres) in size (USEPA 1993). All parts of a home range are not used equally and may instead be compromised of several activity centers that are interconnected by a stream or coast. While shelter and resting sites play a role, the availability of food often has the greatest influence on habitat use. Raccoons feed in shallow areas and thus would only be exposed to environmental media along the shoreline of Coke Point. Because otter feed in open water, they would be exposed to media across the entire Coke Point Offshore Area.

4.2.7.2 Area Use Factors and Qualitative Evaluation

The exposure models used in the risk assessment are based on screening level (maximum) concentrations and reasonable maximum exposure concentrations derived from concentrations in surface sediment, surface water, fish, crab, and benthos representative of the entire 500-acre area around Coke Point. Dependent upon the individual chemical and its distribution, the reasonable maximum exposure may over- or under-estimate risks. For chemicals highest along the shoreline, it may under-estimate risks to heron. For chemicals highest in deeper areas, it may over-estimate risks to heron.

The exposure models also assume that 100 percent of the diet and exposure of piscivorous wildlife occurs within the approximately 500-acre area represented by the samples collected in the Coke Point Offshore Area. The home range of osprey and otters is much larger than the size of the site. Therefore, risks may be over-estimated for these receptors. The home range for herons and raccoons ranges from smaller than the size of the site to much larger. Thus for individuals of these species that forage widely, risks may be over-estimated, but for individuals

with nests or feeding territories at or near Coke Point, risks may be realistic. Therefore, an assumption of 100 percent area use is likely to be conservative but valid. The use of the reasonable maximum case scenario concentration is considered the most valid population-wide exposure estimate.

AUFs can be applied for account for use of other areas by wildlife. These factors are calculated by dividing the area of the site by the area of the home range. The result is a percentage that can be applied to HQs. Based on the area estimates above, the AUFs for wildlife would be:

- between 10 and 50 percent area use by raccoon assuming an accessible shoreline width of 150 ft;
- between 10 percent or less (highly mobile) and 100 percent (solitary) area use by great blue heron;
- between 25 and 68 percent area use by osprey; and
- between 10 and 50 percent area use by river otter.

Based on this information, the Coke Point Offshore Area may comprise the entire home range of individual heron, but a portion of the home range for raccoon, osprey and otter; therefore, an assumption of 100 percent area use is likely to be valid for some but not all receptors and for some but not all individuals within each receptor population. Given the sparse on-shore habitat, Coke Point is likely to support a relatively small number of resident individuals. Results indicate that raccoon and heron may receive most of their exposure to sediments along the shoreline, which include some of the highest concentrations of metals and PAHs, thus some risks to these receptors may be under-estimated. Uncertainty associated with the influence of home range and feeding habits on exposure can be minimized by basing conclusions on reasonable maximum exposure scenarios for otter and osprey, and by basing conclusions on both screening level and reasonable maximum exposure scenarios for heron and raccoon.

4.2.7.3 Revised Risk Estimates Based on AUFs

For each wildlife receptor evaluated in the risk assessment, HQs for the reasonable maximum exposure scenario were modified using AUFs to account for the fact that receptors may not be present within the Coke Point Offshore Area 100% of the time. The modification assumes that the receptors spends a portion of time feeding at Coke Point Offshore Area, and the remainder of the time feeding in the Patapsco River Background Area. AUFs were applied using the following equation:

$$HQ_{AUF} = HQ_{CP} \times AUF + HQ_{PR} \times (1 - AUF)$$

where

HQ_{AUF}	=	Modified HQ for the Patapsco River Background Area (unitless)
HQ_{CP}	=	Reasonable maximum exposure scenario HQ for the Patapsco River Background Area (unitless)
HQ_{PR}	=	Reasonable maximum exposure scenario HQ for the Patapsco River Background Area (unitless)

AUF = Receptor specific area use factor (%)

A range of AUFs was considered based on the values identified in 4.2.8.2. Modified HQs are presented for each receptor in **Table 4.17** through **Table 4.20**.

For heron, 6 chemicals exceed NOAELs for at least one prey-type when 100% area use is assumed. These chemicals are listed below, and chemicals with doses exceeding LOAELs are identified by an asterisk.

Great Blue Heron

100% Area Use/Small Home Range	Large Home Range (10% AUF)
• Copper	• Copper
• Selenium	• Vanadium
• Total LMW PAH (ND = DL)	
• Total PCBs (ND = 0)	
• Total PCBs (ND = DL)	
• Vanadium	

When an AUF of 10% is applied to account for the mobility of many heron and wading birds, NOAEL HQs fall below one for all chemicals but vanadium and copper, which have NOAEL HQs similar to those in background. No chemicals demonstrate doses above LOAELs, even when an AUF of 100% is assumed.

For osprey, 6 chemicals exceed NOAELs for at least one prey-type when 100% area use is assumed. These chemicals are listed below, and chemicals with doses exceeding LOAELs are identified by an asterisk.

Osprey

100% Area Use	Small Home Range (68% AUF)	Large Home Range (25% AUF)
• Copper	• Copper	• Copper
• Selenium	• Selenium	• Vanadium
• Total LMW PAH (ND = DL)	• Total LMW PAH (ND = DL)	
• Total PCBs (ND = 0)	• Vanadium	
• Total PCBs (ND = DL)		
• Vanadium		

Four chemicals (copper, selenium, total LMW PAHs, and vanadium) demonstrate doses above NOAELs when an AUF of 68% is assumed. When an AUF of 25% is applied to account for the mobility of osprey, NOAEL HQs fall below one for all chemicals but vanadium and copper, which have NOAEL HQs similar to those in background. No chemicals demonstrate doses above LOAELs, even when an AUF of 100% is assumed.

For raccoon, 10 chemicals exceed NOAELs for at least one prey-type when 100% area use is assumed. These chemicals are listed below, and chemicals with doses exceeding LOAELs are identified by an asterisk.

Raccoon

100% Area Use	Small Home Range (50% AUF)	Large Home Range (10% AUF)
• Aluminum*	• Aluminum*	• Aluminum*
• Arsenic	• Copper*	• Copper*
• Copper*	• Selenium*	• Selenium*
• Selenium *	• TCDD TEQ (ND = DL)	• TCDD TEQ (ND = DL)
• TCDD TEQ (ND = DL)	• Total HMW PAH (ND = DL)	• Total HMW PAH (ND = DL)
• Thallium	• Total PCBs (ND = 0)*	• Total PCBs (ND = 0)*
• Total HMW PAH (ND = DL)	• Total PCBs (ND = DL)*	• Total PCBs (ND = DL)*
• Total PCBs (ND = 0)*	• Vanadium	
• Total PCBs (ND = DL)*		
• Vanadium		

When AUFs of 10% are applied to account for the mobility of raccoons, NOAEL HQs remain above one for 7 chemicals. Aluminum, copper, selenium, and PCBs are the only chemicals which demonstrate LOAEL HQs that are above one. HQs for aluminum, copper and selenium are similar to background HQs, as previously discussed.

For river otter, 10 chemicals exceed NOAELs for at least one prey-type when 100% area use is assumed. These chemicals are listed below, and chemicals with doses exceeding LOAELs are identified by an asterisk.

River Otter

100% Area Use	Small Home Range (50% AUF)	Large Home Range (10% AUF)
• Aluminum*	• Aluminum*	• Aluminum*
• Arsenic	• Copper*	• Copper*
• Copper*	• Selenium*	• Selenium*
• Selenium *	• TCDD TEQ (ND = DL)	• TCDD TEQ (ND = DL)
• TCDD TEQ (ND = DL)	• Total HMW PAH (ND = DL)	• Total HMW PAH (ND = DL)
• Thallium	• Total PCBs (ND = 0)*	• Total PCBs (ND = 0)*
• Total HMW PAH (ND = DL)	• Total PCBs (ND = DL)*	• Total PCBs (ND = DL)*
• Total PCBs (ND = 0)*	• Vanadium	
• Total PCBs (ND = DL)*		
• Vanadium		

When AUFs of 10% are applied to account for the mobility of otter, NOAEL HQs remain above one for 7 chemicals. Aluminum, copper, selenium, TCCD TEQ (ND=DL), and PCBs are the only chemicals which demonstrate LOAEL HQs that are above one. HQs for aluminum, copper, selenium, and TCDD TEQs are similar to background HQs, as previously discussed.

It is important to note that actual receptors may forage beyond the areas evaluated in this assessment as part of either the Coke Point Offshore Area or the Patapsco River Background Area. They may therefore encounter chemicals in other areas of the Harbor and Chesapeake Bay that are higher or lower than those evaluated here, and thus actual overall risks may be over- or under-estimated. This is an uncertainty.

4.2.8 Measurement Endpoint: Evaluation of Bioavailability

Evaluation of bioavailability information for the offshore area is included as a measurement endpoint because, as discussed above, TRVs may overestimate risks because they do not incorporate consideration of site-specific bioavailability from directly ingested sediment. As discussed above for aquatic and benthic organisms, there is evidence from SEM/AVS data collected during the 2003 reconnaissance study (EA 2003) that metals in sediment may be bound to sulfides that decrease their bioavailability and toxicity. This bears relevance for wildlife food web modeling, especially where a precautionary default factor of 1 is assumed for bioaccumulation of chemicals into prey item tissue. This is the case for vanadium. If metals are bound to sulfides in sediment, their potential to bioaccumulate would be limited. This measurement endpoint indicates that the potential for risks from direct ingestion of these metals in sediment may be overestimated.

Results of laboratory bioaccumulation studies discussed above in Section 4.1.7 and in detail in **Appendix H** indicate that metals, PAHs, and PCBs in Coke Point sediments are available for uptake. This provides evidence that chemicals in Coke Point Offshore Area sediments may be bioavailable if directly ingested.

4.2.9 Summation of COPCs based on Benchmark and Background Exceedences

Sections 4.2.4 through 4.2.8 discuss separate lines of evidence based on scenarios used to evaluate risks based on different EPCs, different prey types, different receptors, and relative risk between exposure areas (the Coke Point Offshore Area versus the Patapsco River Background Area. The reasonable maximum exposure scenario is considered the most relevant for evaluation of risks for wildlife. The following bulleted sections summarize the weight of evidence for each chemical with doses exceeding NOAELs under a reasonable maximum scenario, and draw a conclusion based on benchmark exceedence, background comparisons, AUFs, and bioavailability as to whether the chemical should be considered as a COC for wildlife.

- ***Aluminum***: Aluminum presents a potential risk to mammalian receptors based on the fact that both NOAEL and LOAEL reasonable maximum exposure HQs are greater than 1 for all prey types. However, HQs are similar between the Coke Point Offshore Area and the Patapsco River Background Area. Therefore, aluminum is not considered to be a site-related COC for wildlife.
- ***Arsenic***: Arsenic presents a potential risk to mammalian receptors because reasonable maximum exposure NOAEL HQs are greater than 1 for the benthos prey scenario. However, reasonable maximum exposure LOAEL HQs are less than 1 for the Coke Point

Offshore Area are only marginally greater than 1 for NOAEL HQs. Therefore, arsenic is not considered to be a COC.

- ***Copper***: Reasonable maximum exposure NOAEL and LOAEL HQs for copper are greater than 1. However, the difference between the Coke Point Offshore Area and the Patapsco River Background Area is less than a factor of 2. Also, benthic organism tissue comparisons do not indicate a significant difference between the two areas in the amount of copper entering the food chain from sediment. Therefore, copper is not considered to be a site-related COC.
- ***Selenium***: Both reasonable maximum exposure NOAEL HQs and LOAEL HQs exceed 1 for selenium. The differences in magnitude are less than a factor of 2 between the Coke Point Offshore Area and the Patapsco River Background Area, and in some cases background risks are higher. Therefore, selenium is not considered to be a site-related COPC.
- ***Thallium***: Reasonable maximum exposure NOAEL HQs are greater than 1 for the benthic prey exposure pathway. However, Coke Point Offshore Area and Patapsco River Background Area HQs are similar. Therefore vanadium is not considered to be a site-related COPC.
- ***Vanadium***: Reasonable maximum exposure NOAEL HQs are greater than 1 for the benthic prey exposure pathway. However, Coke Point Offshore Area and Patapsco River Background Area HQs are similar. Therefore vanadium is not considered to be a site-related COPC.
- ***HWM PAHs***: Bioaccumulation studies indicate that HMW PAHs are taken up into the food chain at levels higher than in background, both at lower trophic levels (benthos) and higher trophic levels (fish and crab). Reasonable maximum exposure NOAEL HQs are greater than 1, and Coke Point Offshore Area HQs are 10 times greater than the Patapsco River Background Area HQs. However, LOAEL HQs for reasonable maximum exposures are less than 1, and NOAELs for piscivorous birds fall below 1 when AUFs are considered. It is also noteworthy that screening level scenarios produce NOAEL and LOAEL HQs greater than 1 and greater than background. Therefore, HMW PAHs are considered to be site related COCs, but with a limited potential for impacts under maximum exposure scenarios only.
- ***LWM PAHs***: Bioaccumulation studies indicate that HMW PAHs are taken up into the food chain at levels higher than in background, both at lower trophic levels (benthos) and higher trophic levels (fish and crab). Reasonable maximum exposure NOAEL HQs are greater than 1 for piscivorous birds for benthic prey exposures only. LOAEL HQs for reasonable maximum exposures are less than 1, and NOAEL HQs fall below 1 for piscivorous birds when AUFs are considered. It is also noteworthy that screening level scenarios produce NOAEL and LOAEL HQs greater than 1 and greater than background.

Therefore, LMW PAHs are considered to be site related COCs, but with a limited potential for impacts under maximum exposure scenarios only.

- ***Total PCBs***: Both reasonable maximum exposure NOAEL HQs and LOAEL HQs exceed 1 for total PCBs. Bioaccumulation studies indicate that PCBs are taken up into the food chain at levels higher than in background in benthos and fish, but higher in background than the Coke Point Offshore Area in crab. NOAEL and LOAEL HQs also exceed 1 when area use factors are considered, with greatest exceedences based on benthic prey scenarios. Therefore, total PCBs are considered at site-related COC; however, it is noted that risk from PCBs via some pathways may be similar to or greater than Coke Point Offshore Area risks.
- ***Dioxins***: Reasonable maximum exposure NOAEL HQs are greater than 1. However, Coke Point Offshore Area and Patapsco River Background Area HQs are similar and LOAEL HQs are less than 1. Therefore dioxins are not considered a site-related COPC.

In summary, LMW PAHs, HMW PAHs, and PCBs are identified as site-related COCs. However, LMW PAHs and HMW PAHs have a limited potential for impacts under maximum exposure scenarios only. Also, risks from PCBs at Coke Point may in some cases be similar to or less than background risks.

4.2.10 Risk Characterization for Wildlife in the Coke Point Offshore Area

The risk characterization for wildlife draws from five measurement endpoints to derive conclusions regarding the potential for risks. The results for each measurement endpoint are discussed and weighed as evidence to determine whether chemicals in the Coke Point Offshore Area are expected to pose potential risk to wildlife. The following five measurement endpoints are evaluated:

- Comparison of modeled food web doses to NOAEL and LOAEL TRVs for birds and mammals using a precautionary screening level scenario.
- Comparison of modeled food web doses to NOAEL and LOAEL TRVs for birds and mammals using a reasonable maximum scenario.
- Comparison of risk estimates for the Coke Point Offshore Area to risks for the Patapsco River Background Area.
- Comparison of reasonable maximum scenario food web doses to NOAEL and LOAEL TRVs after they have been modified with AUFs that account for wildlife movement.
- Qualitative evaluation of chemical bioavailability in sediment.

Within these measurement endpoints, bioaccumulation to wildlife from consumption of three different types of prey – benthos, crabs, and fish – were considered, as well as consumption of sediment and water.

The first measurement endpoint – benchmark comparisons using screening level doses - provides precautionary initial estimate of risks under worst case exposures in which a receptor is constantly exposed to the highest concentrations detected on site. NOAEL benchmarks are most precautionary, while LOAEL benchmarks provide a more definite indicator of risks. Screening scenario doses (based on maximum detected sediment and water concentrations) of nine metals, TCDD TEQs, total PCBs, total LMW PAHs, and total HMW PAHs exceed NOAEL-based TRVs. When LOAEL TRVs are considered, screening scenario doses for four metals (cadmium, arsenic, copper, and selenium), total PCBs, total LMW PAHs, and total HMW PAHs exceed.

The second measurement endpoint – benchmark comparisons using reasonable maximum exposure scenario doses – provide a more realistic indicator of risks to wildlife because it characterizes site-wide exposures rather than worst case exposures. Reasonable maximum exposure scenario doses of six metals, TCDD TEQs, total PCBs, total LMW PAHs, and total HMW PAHs exceed NOAEL-based TRVs. The six metals are aluminum, arsenic, copper, selenium, thallium, and vanadium. When LOAEL TRVs are considered, doses for three metals and total PCBs exceed LOAEL-based TRVs and background doses. The three metals are aluminum, copper, and selenium. Reasonable maximum exposure scenario results are considered more relevant than screening level scenario results to characterization of risks to wildlife.

The third measurement endpoint is comparison of Coke Point Offshore Area risks to Patapsco River Background Area risks. There may be other sources of chemicals to sediment, water and biota in the Patapsco River, and it is useful to understand which risks are related to sources at Coke Point and which may be present due to more widespread sources. Based on the screening level scenario, nine metals, LMW PAHs, HMW PAHs, PCBs, and dioxins have both doses that exceed NOAELs and background doses for either birds or mammals. Under the reasonable maximum exposure scenario, LMW PAHs, HMW PAHs, and PCBs have both doses that exceed both NOAELs and background doses for either birds or mammals. Reasonable maximum exposure doses of dioxins, aluminum, copper, selenium, thallium, and vanadium exceed NOAEL HQs, but HQs are very similar between Coke Point and background. Alternative treatments of background data were found to reduce background risks by an order of magnitude as documented in Appendix G; this increases the difference between risks in the Coke Point Offshore Area and risks in the Patapsco River Background Area.

The fourth measurement endpoint was consideration of area use by wildlife. Wildlife home ranges vary between species and between individuals. Heron and raccoon are most likely to feed along the shoreline where many chemical concentrations are highest. Osprey and otter would feed throughout the site. When AUFs are used to modify HQs for the reasonable maximum scenario, PCBs are the only chemicals with doses that both exceed LOAELs and are elevated above background risks. PAHs only produce risks to wildlife when NOAELs are considered.

The fifth measurement endpoint is consideration of chemical bioavailability. As documented in Appendix H, laboratory bioaccumulation tests provide evidence that chemicals in sediment are bioavailable and may be taken up into prey tissue. Concentrations of many metals, PAHs, and PCBs are found at concentrations higher in benthic organisms exposed to sediment from Coke Point Offshore Area than those exposed to sediment from the Patapsco River Background Area.

Tissue data confirm that this trend is observed in higher trophic level species (i.e. fish and crabs) as well for PAHs and metals. PCBs are higher in whole body fish tissue from the Coke Point Offshore Area, and in crab tissue from the Patapsco River Background Area. BAFs and tissue data provide site-specific estimates of bioaccumulation that were used in exposure models. Results of exposure models based on ingestion of fish and crab produced fewer exceedences than those based on benthos, indicating that lower trophic level bioaccumulation has the greatest potential for effects on wildlife through the food chain. AVS/SEM data indicate that not all of the metal present in sediment is available for uptake through direct consumption; this indicates that risks from direct consumption of sediment may be over-estimated.

Taken together, these lines of evidence indicate that the PCBs and PAHs are the COCs for the Coke Point Offshore Area. Metals, dioxins, and VOCs are not considered COCs because they demonstrate reasonable maximum scenario HQs that are either comparable to background HQs or below LOAELs. PCBs are a site-related COC because both NOAEL and LOAEL reasonable maximum scenario HQs are greater than 1 and because HQs for some prey types are greater than those in background. It must be noted however, that exposure pathways based on ingestion of crab produce higher HQs for background. HMW PAHs and LMW PAHs are considered to be site related COCs, but with a limited potential for impacts under maximum exposure scenarios only. Impact is considered limited because reasonable maximum scenario doses of PAHs exceed NOAELs but not LOAELs. HMW PAHs and LMW PAHs are maintained as COCs because both tissue concentrations and doses are higher in the Coke Point Offshore Area than in the background area and because screening level scenarios produce LOAEL exceedences.

The finding of the ERA is that wildlife which consume aquatic and benthic organisms are potentially at risk from PCBs in sediment at the Coke Point Offshore Area. HMW PAHs and LMW PAHs are also considered to be site related COCs, but with a limited potential for impacts under maximum exposure scenarios only. Metals, dioxins, and VOCs are not considered COCs because they demonstrate reasonable maximum scenario exposures that are either comparable to background or below LOAELs. Conclusions are synthesized and used as the basis for recommendations in Chapter 6. There are a number of uncertainties associated with the risk assessment that will be discussed in Section 4.3.

4.3 UNCERTAINTY ANALYSIS

ERAs conducted under USEPA guidance for contaminated sites involve a number of uncertainties (USEPA 1997a). These uncertainties must be taken into consideration when interpreting risk characterization results. The following sections discuss uncertainties associated with the ERA for the Coke Point Offshore Area, and how these uncertainties may affect interpretation.

4.3.1 Scope and the CSM

Several uncertainties are associated with the scope of the ERA and the ecological CSM. The ERA is designed to evaluate potential risks under existing conditions in the Coke Point Offshore Area. The risk assessment focuses on grab samples of surface sediments (1 ft in depth or less) and surface water because these are the most likely exposure media for ecological receptors.

However, the Site Assessment (EA 2009b) found higher concentrations of some metals and PAHs in offshore subsurface sediments than in surface sediments. The risk assessment does not evaluate future hypothetical risks that could occur if erosion or mixing changes the distribution of chemical concentrations in the sediment profile. If higher, chemical concentrations in the subsurface are exposed, risks would be expected to increase.

There are also uncertainties associated in differences between the area of concern selected for evaluation in the assessment and the home ranges of ecological receptors. Heron, osprey, raccoon, otter, and represented wildlife may have home ranges larger than the Coke Point Offshore Area. The risk assessment assumes that these receptors receive all of their food and ingested media from the offshore area. In actuality, wildlife may receive inputs from other nearby areas. Depending on the inputs received from other nearby sources, total risks to receptors may be either over or underestimated. Data from fish and crabs collected from the site and background area help diminish this uncertainty because these are mobile receptors and because these are likely prey species for wildlife. Thus, the risk assessment provides the most relevant quantification of risks for the Coke Point Offshore Area.

4.3.2 Data Used in the Risk Assessment

There are uncertainties associated with the data set used in the ERA. Chemical concentrations in environmental media may vary over space and time. If this variation occurs over small scales, it is possible that the data set over- or under-estimates overall concentrations. Uncertainty due to temporal variability is especially relevant to surface water results because surface water is subject to mixing and variable upstream input. To mitigate this uncertainty, sampling was designed specifically to provide data relevant to the ERA. Sampling targeted areas of suspected chemical contamination and the spatial resolution was selected to provide relevant results. Multiple depths and repeat sampling were used to mitigate for variability in surface water. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

There is uncertainty associated with the fact that data originated from multiple studies. To mitigate this uncertainty, data from each study were reviewed for relevance and only validated, relevant data were utilized. It should be noted that data may be available from other studies of the area that were not utilized due to uncertainties associated with differences in study design, analytical suite, or validation. In specific, data from a 2005 study of VOCs in surface water by Severstal were not included because they utilized a different study design, a limited analytical suite, and were not validated. Benzene concentrations from samples in that study ranged from non-detect to 0.330 mg/L. These concentrations are higher than those detected in the sampling conducted to support the ERA, which ranged from non-detect to 0.072 mg/L. These differences in chemical concentrations over time are a source of uncertainty.

There is also uncertainty associated with samples used to represent the Patapsco River Background Area. Background samples for surface sediment demonstrated substantial variability, with a range of concentrations for metals and PAHs spanning an order of magnitude. Given the variety of environments and potential sources to background, this is not necessarily unexpected. Because insufficient samples were available to calculate a 95% UCLM, the maximum concentration in background sediment were sometimes used to represent the screening

level and reasonable maximum exposure scenario. Effects of this uncertainty are further evaluated in a Sensitivity Analysis provided in **Appendix G**.

Use of tissue data from laboratory bioaccumulation studies presented in **Appendix H** reduces the potential uncertainty associated with food web exposure models used in the risk assessment when compared to use of literature-based BAFs. However, there are some uncertainties associated with these data. Laboratory bioaccumulation tests are conducted in a controlled environment. Because lab bioaccumulation test conditions may differ from those experienced by aquatic organisms in the field, bioaccumulation may differ and thus be over-estimated or under-estimated by laboratory bioaccumulation test results. To minimize this uncertainty, the sediment used for laboratory bioaccumulation tests was carefully selected to represent site-wide conditions as closely as possible, and standard test methods were used which utilize organisms and parameters representative of a range of situations. There are also uncertainties associated with field-collection of fish and crabs for tissue. Collection of tissue in a single event may not account for variability in concentrations over long periods of time due to seasonal variation, migration, or changing site conditions. This may result in over- or under- estimation of risks. To minimize these uncertainties, a large number of individual specimens were collected and composited using sampling criteria that help minimize the impacts of variation.

There is also uncertainty associated with the concentrations of metals detected in the surface water samples from the investigation area. All of the surface water data included in the quantitative risk calculations were from unfiltered samples. As a result, the concentration of metals detected in surface water samples very likely include metals that are sorbed to suspended particulate matter (sediment). These sorbed metals are less available for uptake by receptors of concern. Therefore, the detected concentrations may not be representative of the amount of bioavailable metals, and the use of these water pathway data could overestimate the potential for risk from surface water.

4.3.3 Exposure and Toxicity Assessment

The selection of exposure and toxicity data for inclusion in the ERA involves a number of uncertainties. Actual exposure factors and toxic responses for ecological receptors vary. The risk assessment mitigates for uncertainty associated with this variability by utilizing technically defensible values provided by guidance, scientific literature, and field/laboratory collected tissue data. Where necessary, statistical analyses are used to summarize a range of exposure and toxicity data to provide a single value for use in the ERA. In cases where estimation is necessary, values are selected with precaution to further mitigate uncertainty. In cases where no data are available for a chemical, exposure or toxicity data for chemicals with similar structures and expected modes of toxicity are substituted as surrogates. Where surrogate data are not available for exposure factors, conservative default values consistent with standard practices are utilized.

Surface water ingestion by wildlife is a source of uncertainty. Surface water ingestion rates are based on USEPA guidance (USEPA 1993), which provides rates based on estimated metabolic requirements for consumption of water. However, while wildlife are likely to consume some water while swimming (for mammals) or grooming and feeding (birds and mammals), they are

unlikely to intentionally consume brackish water such as that of the Patapsco River for metabolic purposes. No rates are available for incidental ingestion of water; therefore, available values are used unchanged as a precaution. Overall, surface water ingestion rates are high but not inconceivable for incidental ingestion during swimming or foraging. Based on the rates and body masses provided in **Table 4.6**, the ingestion rates used in the assessment equate to ingestion of 77 and 107 milliliters (mL) per day (1/3 to 1/5 cup) of water per day for osprey and heron, and 564 and 599 mL per day (2.4 to 2.5 cups) of water per day for raccoon and otter.

Area use by wildlife is a source of uncertainty. The Coke Point Peninsula provides little upland habitat to support nearby foraging for wildlife, and offshore area may provide limited habitat for foraging. Thus, the assumption that wildlife use the site 100 percent of the time is likely an over-estimate and would lead to some over-estimation of risks.

In some cases, toxicity data are unavailable for specific chemicals, and no surrogates are found appropriate. In such cases, risks from these chemicals cannot be quantitatively evaluated. The potential for risks from these chemicals is identified as an uncertainty.

4.3.4 Risk Characterization

There are uncertainties associated with the overall characterization of risks in the ERA. One apparent uncertainty results from the extrapolation of assumptions about the potential for adverse effects from individual organisms to populations. The intent of this ERA, as set forth in the assessment endpoints, is to ultimately evaluate risks to populations. However, for wildlife, the models perform calculations concerning the potential for adverse effects to individual organisms. Few methods are available to extrapolate the potential for adverse effects from the individual level to the population level. It is generally assumed that if there is no potential for direct adverse effects to individual organisms then it is also unlikely for there to be the potential for direct adverse effects to populations. Similarly, it is assumed that if there is the potential for adverse effects to individual organisms there is also the potential for adverse effects to populations. However, there is uncertainty associated with the assumption that potential impacts at the individual level will impact the populations in the surrounding ecosystem.

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5. HUMAN HEALTH RISK ASSESSMENT FOR PUBLIC HEALTH IMPACTS

Two separate HHRAs are evaluated in this report. This section presents the methods and results for the HHRA-PH. The HHRA-PH characterizes human exposures given the current conditions of the offshore area. Currently, the offshore area around Coke Point is not expected to be frequently for swimming or other water activities, and it is expected that people would visit other, more easily accessible areas available in close proximity to Coke Point Offshore Area (e.g., state parks, private docks, etc.). However, there are no controls against these activities, so there is a potential for these activities. This exposure scenario takes into account exposures modeled in previous RCRA investigations and consultation with site-specific USEPA and MDE inputs (ISG 2005 and USEPA/MDE 2011a). The HHRA-PH provides an estimate of a site-specific exposure that takes into account the mobility of aquatic organisms in the offshore area by evaluating sample results from studies of field-collected crab and fish tissue. The results of the HHRA-PH provide a long-term risk characterization of the people fishing/crabbing in the area under current conditions.

The HHRA quantitatively evaluates the complete exposure pathways identified in the CSM (Chapter 2) for potential long-term risk concerns for human health. The HHRA is a process in which exposure and toxicity data are combined to develop an estimate of the potential for adverse impacts on human receptors from chemicals in the environment. The HHRA determines baseline risks associated with long-term exposure to the offshore areas. The baseline risk does not take into account any remedial actions or other means of exposure reduction (e.g., the use of personal protective equipment, fishing restrictions, etc.). In addition, future potential risks associated with changes at the site (i.e., dredging or erosion) are not evaluated in the HHRA.

The HHRA specifically follows the analysis methods set forth in the following USEPA guidance:

- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part A) (Interim Final), USEPA 1989.
- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual Supplemental Guidance – "Standard Default Exposure Factors" (Interim Final), Publication 9285.7-01B, USEPA 1991.
- Guidelines for Data Usability in Risk Assessment (Part A). Office of Solid Waste and Emergency Response (OSWER), Publication OSWER9285.7-09A, USEPA 1992.
- Exposure Factors Handbook, Volumes I, II, and III, USEPA 1997b.
- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments). Office of Emergency and Remedial Response, Washington, DC, USEPA 2002.
- Human Health Toxicity Values in Superfund Risk Assessments. OSWER 9285.7-53. Office of Emergency and Remedial Response, USEPA 2003b.

- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part E: Supplemental Guidance for Dermal Risk Assessment) Final, USEPA 2004.

These guidance documents comprise the basis of risk assessment methodology in the RCRA/CERCLA programs and are intended to provide a conservative estimate of potential risk within these regulatory programs. The risks determined in the HHRA represent potential risk that may occur to people who contact the areas evaluated and do not represent acute risks from short-term exposures.

The HHRA methodology involves a four-step process: data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization. The following sections present details about HHRA methodology. Data collection and evaluation are presented in Section 5.1. The exposure assessment is presented in Section 5.2, and the toxicity assessment is presented in Section 5.3. The risk characterization is presented in Section 5.4. A discussion of uncertainties is presented in Section 5.5.

5.1 DATA COLLECTION AND EVALUATION

The HHRA evaluates data collected for the offshore areas as discussed in Chapter 3. All data used in the HHRA are validated per protocols identified in USEPA guidance for data usability (USEPA 1992). Inclusion or exclusion of data on the basis of analytical qualifiers is performed in accordance with USEPA guidance (USEPA 1989, 1992). The first step in the HHRA is the evaluation of analytical data on the basis of qualifiers in each medium of concern (surface sediment, surface water, and tissue) using the rationale below.

- Analytical results bearing the R qualifier (indicating that the data point was rejected during the data validation process) are not used in the risk assessments.

- Analytical results bearing the U or UJ qualifier (indicating that the analyte is not detected at the given RL) are retained in the data set and considered non-detects. Where warranted for statistical purposes, each COPC is assigned a numerical value equal to its RL or appropriate detection limit.

- Analytical results for organics bearing the J qualifier (the reported value is estimated and below the RL), K qualifier (reported value may be biased high), L qualifier (reported value may be biased low), and N qualifier (the spiked recovery is not within control limits) are retained in the data set at the measured concentration.

- Analytical results for inorganic chemicals bearing the B or BJ qualifiers (which indicate that the reported value is less than the contract-required detection limit, but greater than the method detection limit) are retained in the data set at the measured concentration.

- Analytical results for organic compounds bearing the B qualifier (blank-related data) are evaluated as non-detects. The B qualifier denoting blank-related data indicate that the chemical in question was detected not only in the sample but also in quality assurance blanks.

If duplicate samples are collected or duplicate analyses are conducted on a single sample, the following guidelines are employed to select the appropriate sample measurement:

- If both samples/analyses show that the analyte is present, the average of the two detected concentrations is retained for analysis, based on conservative professional judgment;

- If both samples/analyses are not detected, the average of the two RL concentrations is retained for analysis as a non-detect; and

- If only one sample/analysis indicated that the analyte is present, it is retained for analysis and the non-detect value is not included in the assessment.

Several classes of organic chemicals assessed in the HHRA share a common mode of exposure and toxicity. For example, there are over 200 PCB congeners that can be identified by analytical chemistry. Many congeners produce the same types of effects and share similar patterns of uptake. The same is true for dioxins. As a result, these classes of organic chemicals are evaluated in accordance with the following methodologies:

- **PCBs** – USEPA policy identifies a standard method for using congener-specific data to estimate the total concentration of PCBs (Van den Berg et al. 1998). Per this method, the concentrations of 18 specific congeners are summed and the sum is doubled to determine a representative total PCB concentration for each sample. The specific PCB congeners used in the evaluation are: PCB 8, PCB 18, PCB 28, PCB 44, PCB 49, PCB 52, PCB 66, PCB 77, PCB 87, PCB 90, PCB 101, PCB 105, PCB 118, PCB 126, PCB 128, PCB 138, PCB 153, PCB 156, PCB 169, PCB 170, PCB 180, PCB 183, PCB 184, PCB 187, PCB 195, PCB 206, and PCB 209. The total PCBs calculated and evaluated in the HHRA use the RLs to represent non-detect compounds.
- **Dioxins and furans** – For dioxins and furans, studies have been performed to develop TEFs that relate the toxicity of common dioxins and furans to the specific toxicity of the dioxin 2,3,7,8-TCDD (Van den Berg et al. 1998, 2006). These TEFs produce a dioxin/furan concentration representative of the cumulative toxicity of the congeners referred to as a TCDD TEQ for each sample. The HHRA evaluates a TCDD TEQ estimated using RLs to represent non-detect compounds.

It is noted that the handling of PAH compounds within the HHRA is treated differently than the ERA. The ERA evaluates the effects of PAH classes (i.e., HMW and LMW), while the HHRA evaluates individual PAH compounds. Therefore, the determination of ecological risks evaluates PAH concentrations that are summed prior to modeling, and the HHRA evaluates each individual PAH compound separately and sums the risks after modeling.

Sample results for arsenic are reported as total arsenic. However, arsenic can be present in both an organic and inorganic form. Inorganic arsenic represents the primary form of arsenic that is a concern for human health. Therefore, an arsenic speciation was performed for the field-collected tissue samples within the Coke Point Offshore and Patapsco River Background Areas to quantify the various forms of arsenic. The results of the arsenic speciation are included on **Table 5.1**. The average percent of inorganic arsenic for crab meat, crab mustard, and fish filet were

averaged together to obtain an overall aquatic organism average percent of inorganic arsenic. The average percent of inorganic arsenic is 10.4 percent for the Coke Point Offshore Area and 12.0 percent for the Patapsco River Area. To maintain consistency within the exposure areas, the average percent of inorganic arsenic for the Coke Point Offshore Area is used in calculating intake of inorganic arsenic in fish tissue and crab meat for the HHRA. For screening, the concentration of arsenic within fish tissue and crab meat is not reduced by the 10.4 percent. This allows for the conservative nature of the screening to remain.

5.1.1 Risk-Based Screening

An initial step of the HHRA is a risk-based screening that is conducted to determine COPCs. The selection of COPCs allows the HHRA to focus on chemicals that may contribute to overall risks (USEPA 1989). Chemicals below risk-based screening criteria are not detected at levels that would affect overall risk and are not considered further in the HHRA. For surface water and sediment, the maximum detected chemical concentration is compared to risk-based screening values. For fish and crab tissue, the 95%UCLM is used in the risk-based screening.

State and Federal risk-based screening criteria are not available for surface water and surface sediment for the complete exposure pathways identified in the CSM (**Figure 2.2)**. As a result, site-specific risk-based criteria are calculated for the exposure to surface water and sediment pathways. The derivation of site-specific risk-based screening criteria follows the methodologies set forth in USEPA guidance (USEPA 2010b). **Appendix D** presents the calculation of site-specific risk-based screening criteria for surface water and surface sediment. The site-specific risk-based screening criteria are based upon a carcinogenic risk level of 10^{-6} or non-carcinogenic hazard quotient (HQ) of 0.1. The risk levels of 10^{-6} and an HQ of 0.1 provide a level of conservancy to account for potential additive effects of multiple chemicals.

The HHRA takes into account actual, field-collected fish and crab tissue and fish and crab tissue concentrations modeled from BAFs for surface water and surface sediment. For chemical concentrations modeled from BAFs, aquatic organisms exposed to surface water are represented by fish, and aquatic organisms exposed to sediment are represented by crabs or other bottom dwellers. Fish and crab concentrations for both field-collected organisms and modeled concentrations are compared to USEPA Region 3 risk-based concentrations (RBCs) for fish tissue (USEPA 2009b). For non-carcinogens, the RBC is based on a HQ of 1.0; for the purposes of this screening the RBC is decreased by a factor of 10 to base the screening value on an effective HQ of 0.1. Carcinogenic RBCs are based on a risk level of 10^{-6}. Chemicals considered COPCs in the fish and crabs are also considered COPCs in surface water and sediment, respectively, regardless of screening value comparison to ensure that the total exposure to chemicals in these media is fully evaluated in the HHRA.

5.1.1.1 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of COPCs based upon the risk-based screening are shown in medium-specific tables following the RAGS D format (USEPA 2002). **Tables 5.2.1** through **5.2.4** present the risk-based screening results for Coke Point Offshore Area media of concern. **Tables 5.2.5** through **5.2.8** present the risk-based screening results for the Patapsco

River Background Area. The tables present the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as the frequency of detection (FOD) for each chemical detected. COPCs that exceed risk-based screening criteria are highlighted and presented in bold type. COPCs for all media evaluated in the HHRA are presented in the following sections:

Coke Point Offshore Area

COPCs in Surface Sediment

The following COPCs are identified in surface sediment (**Table 5.2.1**) based on the risk-based screen: arsenic, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, and total PCBs.

COPCs in Surface Water

The following COPCs are identified in surface water (**Table 5.2.2**) based on the risk-based screen: benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, indeno(1,2,3-cd)pyrene, and benzene.

COPCs in Field-Collected Crab

The following COPCs are identified in crabs (**Table 5.2.3**) based on the risk-based screen: dioxin, arsenic, cadmium, cobalt, copper, selenium, zinc, benzo(a)pyrene, benzo(b)fluoranthene, total PCBs, and benzene.

COPCs in Field-Collected Finfish Tissue

The following COPCs are identified in finfish tissue (**Table 5.2.4**) based on the risk-based screen: arsenic, mercury, selenium, total PCBs, and benzene.

Patapsco River Background Area

COPCs in Sediment

The following COPCs are identified in background surface sediment (**Table 5.2.5**) based on the risk-based screen: benzo(a)pyrene and total PCBs.

COPCs in Surface Water

The following COPCs are identified in background surface water (**Table 5.2.6**) based on the risk-based screen: benz(a)anthracene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

COPCs in Field-Collected Crab

The following COPCs are identified in background crabs (**Table 5.2.7**) based on the risk-based screen: dioxin, arsenic, cadmium, cobalt, copper, mercury, selenium, zinc, and total PCBs.

COPCs in Field-Collected Finfish Tissue

The following COPCs are identified in background finfish tissue (**Table 5.2.8**) based on the risk-based screen: antimony, arsenic, copper, mercury, selenium, and total PCBs.

5.2 EXPOSURE ASSESSMENT

The exposure assessment determines (qualitatively or quantitatively) the magnitude, frequency, duration, and route of exposure for potential human contact to COPCs in media of concern. The exposure assessment considers only existing conditions at the Coke Point Offshore Areas and does not take into account an future actions within the Coke Point Offshore Area (i.e., dredging, erosion, etc.). Chapter 2, the CSM (**Figure 2.2**), shows the complete exposure pathways identified for the Coke Point Offshore Area. The CSM characterizes the exposure setting with respect to the general physical characteristics of the offshore area and the characteristics of the populations on and near the offshore area based upon existing conditions. The HHRA did not take into account potential future exposures to the offshore area due to erosion, dredging, or other actions. From this exposure characterization, potential receptors are identified. Once the receptors are identified, the pathways by which the previously identified populations may be exposed are determined. These are considered complete pathways of exposure. Each complete exposure pathway identified in the CSM (**Figure 2.2**) is evaluated in the exposure assessment and the HHRA.

The HHRA-PH evaluates human exposures based upon the current use of the offshore area and discussions with the USEPA and MDE. Currently, the offshore area around Coke Point is not frequently used for swimming or other water activities. However, there are no controls against these activities. Exposure for the HHRA-PH represents the low frequency of use for the Coke Point Offshore Area for recreation and takes into account exposures modeled from previous RCRA investigations and US EPA and MDE site-specific inputs (ISG 2005 and USEPA/MDE 2011a). In addition, sample results from studies of field-collected crab and fish tissue are evaluated.

5.2.1 Calculation of Intake

Intake is the numerical representation of estimated exposures. An intake is calculated for each exposure pathway identified in the CSM. Intake is expressed in terms of the quantity of substance in contact with the body per unit body weight per unit time (e.g., milligrams chemical per kilogram body weight per day, also expressed as mg/kg bw-day) (USEPA 1989). Intakes are calculated using variables for chemical concentrations, contact rates, exposure frequency, exposure duration, body weight, and exposure averaging time. The values of some of these variables depend on offshore area conditions and the characteristics of the potential receptors. Exposure estimates are representative of a reasonable maximum exposure which is expected to occur within the Coke Point Offshore Area (USEPA 1989). As a result, some intake variables are not at their individual maximum values, but when combined with other variables, will result in estimates of the reasonable maximum exposure (USEPA 1989).

5.2.2 Exposure Point Concentrations

The first step in quantifying intake (or exposure) is the determination of an EPC for each COPC identified in the risk-based screening. For the HHRA, the EPC represents the concentration of COPCs in media of concern that a selected receptor is expected to contact over a designated exposure period. The EPC is represented by the 95%UCLM (USEPA 1989). The 95%UCLM is used because assuming long-term contact with the maximum concentration is not reasonable (USEPA 1989). EPCs for COPCs identified for the Coke Point Offshore Area are presented in **Tables 5.3.1** through **5.3.4**. EPCs for COPCs identified for the Patapsco River Background Area are presented in **Tables 5.3.5** through **5.3.8**.

For surface water and sediment within the Coke Point Offshore Area and the Patapsco River Background Area, the 95%UCLM is determined through the use of the USEPA ProUCL program version 4.00.04 (USEPA 2009c). Where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration, the maximum concentration is used as the reasonable maximum EPC. Output files of the ProUCL program are included in **Appendix B**. For the Patapsco River Background Area, an additional analysis of the background data is performed in the sensitivity analysis (**Appendix G**) to determine the best representation of background given the limitations of this data set. It is determined that the use of the 95%UCLM, or the maximum detected concentration, is the best representation of EPCs for the Patapsco River Background Area. However, potential human health risks using the median of the data set as the EPC are provided in the Sensitivity Analysis (**Appendix G**) for comparison.

The fish and crab tissue EPCs for metals, PAHs, and PCBs are determined from actual aquatic organisms (white perch and crabs), as discussed below. The concentration of dioxins, tributyltins, VOCs, and SVOCs in crab tissue and fish are based upon literature-based BAFs. For the crabs, the EPC represents the combined chemical concentration in both crab meat and mustard, adjusted by weight. For fish (white perch), only the filet is used in the HHRA.

EPCs derived from field-collected finfish and crab tissue

Field collection of tissue characterizes actual tissue concentrations in aquatic organisms and presents a realistic representation of expected bioaccumulation in higher trophic level game species at Coke Point. The analysis of field-collected finfish and crab tissue takes into account that many aquatic organisms are mobile and may spend time feeding in other parts of Baltimore Harbor or the Chesapeake Bay.

Crab and finfish tissues were analyzed for metals, PAHs, and PCBs. Composited fish filets were analyzed as representative of what humans would most likely consume. For crabs, both meat and “mustard” were analyzed separately.

To determine the total concentration of a chemical within the edible portion of the crab, the following equation was used:

$$C_{EdCrab} = \frac{C_{Mustard} * M_{Mustard} + C_{Meat} * M_{Meat}}{M_{EdCrab}}$$

Where:

C_{EdCrab} = Concentration of chemical in the edible portion of the crab (mg/kg wet weight);
$C_{Mustard}$ = Concentration of chemical in crab mustard (mg/kg wet weight);
C_{Meat} = Concentration of chemical in crab meat (mg/kg wet weight);
$M_{Mustard}$ = Weight of mustard per individual crab (g wet weight);
M_{Meat} = Weight of meat per individual crab (g wet weight).
M_{EdCrab} = Summed Weight of meat and mustard from individual crab (g wet weight).

The ratio of meat to mustard in the crab by mass was assumed to be 4.36:1 based on information from the literature (Weidou 1981).

Tissue concentrations were summarized statistically to create EPCs. The 95%UCLM of tissue concentrations for each chemical were used as the EPCs in fish filets. The 95%UCLMs for crab meat and mustard were used, as described above, to calculate the concentration in edible crab tissue.

EPCs derived using sediment BAFs from literature sources

Sediment BAFs are derived from the scientific literature for dioxins, VOCs, and organotins. Sediment BAFs for dioxins, VOCs, and organotins are presented in **Table 3.8**. USACE maintains a database of chemical-specific biota-sediment BSAFs from studies of a wide range of organisms and sediment types (USACE 2009). Laboratory bioaccumulation tests following protocols similar to those used in this study are one of the primary sources of BSAFs in the database. A BSAF is different from a sediment BAF because it considers the influence of organic carbon in sediment and lipids in tissue on uptake relationships (USACE 2009). For each chemical, EA compiled the mean BSAFs reported for fish and marine and estuarine invertebrates. For each chemical, the average of the BSAFs is calculated, and the values are converted to sediment BAFs using the following equation:

$$BAF_{org\text{-}sed} = \frac{C_{lipid}}{C_{TOC}} \times BSAF$$

Where:

C_{lipid} = Concentration of lipid in tissue (mg/kg dry weight);
C_{TOC} = Concentration of total organic carbon in sediment (mg/kg dry weight);
BSAF = Biota sediment accumulation factor (unitless);

$BAF_{org\text{-}sed}$ = Bioaccumulation factor for chemicals from sediment into biota (unitless)

The conversion assumes an average total organic carbon content in Coke Point sediments of 6.8 percent based on sample results from Coke Point Offshore Area surface sediment samples. When sediment BAFs were not available from this source, a default value of 1 was assigned. This assumes that the concentration in the organism is the same as the concentration in the sediment. This default is used as a standard practice in risk assessment. There are adequate data available from the BSAF database (USACE 2009) for estuarine organisms to develop a BSAF for TCDD that would be relevant to estuarine exposures. However, the database did not contain adequate studies of other dioxin/furan congeners in estuarine organisms to develop BSAFs for the full list of detected congeners. The USACE BSAF database (USACE 2009) does include BSAF data for both TCDD other dioxin and furan congeners from a study of trout, which is a freshwater fish (Burkhard et al. 2004). These freshwater BSAFs are used together with the estuarine TCDD BSAF to extrapolate estuarine BSAFs for each congener based on relative bioaccumulation compared to TCDD. These BSAFs are presented in **Table 3.8**. Following the conversion to a BAF, the EPC of chemicals in crab tissue are determined in the same manner as concentrations from site-specific BAFs.

EPCs derived using surface water BAFs from literature sources

BAFs for chemicals in surface water are derived from information reported in the scientific literature. Literature-based water-to-fish uptake factors or bioaccumulation equations are used to estimate concentrations of COPCs in fish tissue using the following equation:

$$C_{fish} = C_{water} * BAF_{fish\text{-}water}$$

Where:

C_{fish} = Concentration of chemical in fish (mg/kg wet weight);
C_{water} = 95%UCLM of COPC in water (mg/L);
$BAF_{fish\text{-}water}$ = Uptake factor for chemicals in fish (unitless).

Bioaccumulation factors and their sources are summarized in **Table 3.9**. Uptake factors for several organics are derived using regressions from the BCF Win Program developed by the USEPA's Office of Pollution Prevention and Toxics and Syracuse Research Corporation. When these uptake factors are not available for a chemical, literature-based factors are used from sources such as the Risk Assessment Information System (Oak Ridge National Laboratory 2009) and USEPA's Ambient Aquatic Life Water Quality Criteria documents (USEPA 1980, 1985a-c, 1986, 1987a,b).

In the absence of a literature-based bioaccumulation model or uptake factor for a COPC, an accumulation factor of 1 is used to estimate chemical concentrations in fish. Use of this default accumulation factor assumes that the concentration in the organism is the same as the concentration in the surface water, and is expected to provide a conservative estimate of accumulation for most chemicals, and is expected to over-estimate accumulation for non-bioaccumulative compounds. This default is used as a standard practice in risk assessment.

5.2.3 Exposure Parameters

The second step in quantifying intake requires the identification of exposure parameters. The following sections and **Tables 5.4.1** through **5.4.12** detail the exposure parameters for each potential receptor. Specific exposure parameters for each receptor are chosen based on USEPA guidance (USEPA 1989, 1991, 2004, 2008a), state advisories and other appropriate resources.

Exposure parameters include rates of contact (e.g., skin surface areas), exposure frequency and duration, body weight, and averaging time. The contact rate reflects the amount of contaminated media contacted per unit time or event. For dermal contact with chemicals in surface water or sediment, the contact rate is estimated by combining information on exposed skin surface area, dermal permeability of a chemical, and exposure time. Exposure frequency and duration are used to estimate the total time of exposure to COPCs in media of concern. The body weight represents the average body weight over an exposure period (USEPA 1989). For adults (adult recreational users and watermen), USEPA recommended body weight is 70 kilograms (kg); for children (recreational users aged 3 to 6 years), it is 18 kg (USEPA 2008a). The adolescent is assumed to be 45 kg.

Surface Water

As discussed in the CSM (Chapter 2), exposure to surface water for the recreational user assumes a swimming scenario. During swimming, a recreational user will have dermal (skin) contact with surface water and ingest very small amounts of surface water. Any ingestion is expected to be incidental due to the brackish nature of the water. Incidental ingestion is assumed at 1/100th of the USEPA default drinking water rates (Agency for Toxic Substances and Disease Registry [ATSDR] 2003). The incidental ingestion rate is therefore 0.02 liter/day for the adult and 0.01 liter/day for both the adolescent and the child recreational users (ASTDR 2003). The recommended surface area (SA) for adult is 18,000 square centimeters (cm^2) and the child is 6,600 cm^2, based on the mean surface area for the total body (USEPA 2004). For the adolescent, the mean total body area is 15,900 cm^2 for 12 to16 years of age and 10,800 cm^2 for 6 to 11 years. An average of the two age ranges yields a body SA of 13,350 cm^2 for the adolescent aged 6 to 16 years (USEPA 1997b).

The offshore area near the Coke Point Peninsula is not considered a high use area for swimming or other water activities. Additionally, other public access areas are located near but not immediately adjacent to the Coke Point Peninsula that present a more attractive area for swimming and other water activities (i.e., state parks, private docks, etc.). However, access is not controlled to the waters around the Coke Point Peninsula; therefore, swimming is a possibility for this area. Swimming and other activities around Coke Point are assumed on a limited basis. An exposure frequency of 4 days per year is used based upon the previous RCRA EI assessment and personal communication with US EPA and MDE (ISG 2005 and USEPA/MDE 2011a). It is also estimated that recreational users swim for two hours a day. The swim time takes into account that boaters are primarily on the water from noon to 5:00 p.m. with 2 hours of that time spent swimming or in the water.

For the watermen, exposure to surface water is likely limited to the hands and arms (forearms and upper arms). The mean arm SA (2,910 cm^2) combined with the mean hand SA (990 cm^2) results in an SA of 3,900 cm^2 for watermen (USEPA 1997b). It is expected that watermen would not fish exclusively within the Coke Point Offshore Area, but instead would fish near Coke Point 1 day per week for 39 weeks (March through November). Watermen are expected to contact surface water for 2 hours a day based upon personal communication with US EPA and MDE (USEPA/MDE 2011a). This assumes that watermen will perform other activities (i.e., driving the boat, fixing nets, etc.) that will result in less frequent direct water contact.

Sediment

Due to the depth of surface water, recreational users are expected to contact sediment primarily with the feet and maybe lower legs. For the adult, the sum of the mean lower legs SA (2,560 cm^2) and mean feet (1,310 cm^2) is 3,870 cm^2 (USEPA 1997b). For the adolescent, lower leg estimates are not available in USEPA guidance (USEPA 2004, 1997b). Therefore, the SA identified for the adult is used for the adolescent as a conservative measure. For the child, the mean leg (2,070 cm^2) and mean feet (550 cm^2) sum is 2,620 cm^2 for the 3 to 6 year age range (USEPA 2008a). For skin exposure to sediment, an adherence factor (AF) is determined that represents the ability of sediment to adhere to the skin surface (USEPA 2004). AFs for sediments are likely to be less than for soils because contact with water may wash the sediment off the skin (USEPA 2004). However, AFs for soil are used to represent the sediment AFs as a conservative measure. For the adult recreational user, the recommended weighted AF for an adult resident is used [0.07 milligrams per square centimeter (mg/cm^2)] as a conservative measure. The recommended weighted AF for a child recreational user is 0.2 mg/cm^2 for children playing in wet soil (USEPA 2004). The adolescent is conservatively estimated with the same AF as the child.

Watermen contact with sediment is limited to the hands and forearms as contact to sediment is expected to occur while hauling fishing nets into boats. The mean arm SA (2,910 cm^2) and mean hand SA (990 cm^2) sum is 3,900 cm^2. The recommended AF for a commercial or industrial worker contact with soil is 0.2 mg/cm^2, based upon actual body parts exposed (face, forearms and hands) and high-end contact activity (USEPA 2004). This worker AF is conservatively assumed for watermen.

The exposure frequency for contact with sediment is assumed at the same number of days per year as surface water.

Fish and Crab Ingestion

Ingestion rates for the recreational user are taken from both the UESPA guidance (1997b) and the MDE 2007 Fish Advisory Table. USEPA identifies an amount of fish eaten per day from Freshwater/Estuarine areas. However, the USEPA estimate is based upon a total wet weight of fish eaten per year averaged over a number of days, not for each meal. The weights do not account for cooking. The weights for an adult, adolescent, and child are 9.8, 8.7, and 4.6 ounces per day, respectively (USEPA 1997b). MDE estimated the amount of fish eaten per meal for varying receptors to determine appropriate fish advisories for the Patapsco River (MDE 2007).

MDE estimated a cooked weight of fish eaten for an adult male, adult female, and child at 8, 6, and 3 ounces, respectively (MDE 2007). The cooked weights used by MDE correspond to the wet weights presented in the USEPA guidance (USEPA 1997b). The number of meals per year is estimated based upon recreational users fishing or crabbing in the area 2 days per week from June to September (4 months or 16 weeks). The exposure frequency of 32 meals per year of fish and crabs is evenly divided between fish and crab consumption. As a result, the recreational user is assumed to eat 16 meals per year of fish and 16 meals per year of crabs.

The intake rate identified for the adult recreational user is also used for the watermen, since the watermen are not expected to fish exclusively within the Coke Point Offshore Area. The exposure frequency identified for the surface water and sediment pathways is used as the number of meals per year (39 meals per year) of fish and crabs. The watermen is assumed to eat 19.5 meals per year of fish and 19.5 meals per year of crabs.

5.2.4 Exposure Intake Equations

To quantify intake, the EPCs and exposure parameters are combined to estimate daily intakes over an exposure period. The COPCs identified in surface water, sediment, and fish tissue are converted into systemic doses, taking into account rates of contact (e.g., dermal exposure areas) and absorption rate of each COPC. The magnitude (i.e., EPCs), frequency (i.e., number of days per year), and duration of these exposures are then combined to obtain estimates of daily intakes over a specified period of time (i.e., lifetime, activity-specific duration). Dermal exposure to surface water is calculated by converting the EPC into an Absorbed Dose per event (DA_{event}). This conversion takes into account the permeability of compounds across multiple layers of skin with respect to the length of the event and the fraction of each compound absorbed once dissolved into the skin.

Two different measures of intake are analyzed, depending on the nature of the effect being evaluated. When evaluating longer-term (i.e., chronic) exposures to chemicals that produce adverse non-carcinogenic effects, intakes are averaged over the period of exposure (i.e., the averaging time [AT]) (USEPA 1989). This measure of intake is referred to as the average daily intake (ADI) and is a less than lifetime exposure. For chemicals that produce carcinogenic effects, intakes are averaged over an entire lifetime and are referred to as the lifetime average daily intake (LADI) (USEPA 1989).

The generic equation to calculate intakes is given below:

$$(L)ADI = \frac{EPC \ x \ IF \ x \ EF \ x \ ED \ x \ RAF}{BW \ x \ AT} \ \text{x CF}$$

Where:

(L)ADI = (Lifetime) Average daily intake (mg/kg bw-day)
EPC = COPC concentration in a specific medium (mg/kg or mg/L)

IF	=	Intake factor[1] (mg/day, liters per day [L/day], or kg/meal)
EF	=	Exposure frequency (days/year or meals/year)
ED	=	Exposure duration (years)
RAF	=	Relative absorption factor (unitless) (Dermal exposures only)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (10^{-6} kilograms per milligram (kg/mg) or 10^{-3} L/cm^3) (Dermal exposures only)

5.3 TOXICITY ASSESSMENT

Toxicity assessment is the third step of the HHRA process. The toxicity assessment considers the types of potential adverse health effects associated with exposure to COPCs; the relationship between magnitude of exposure and potential adverse effects; and related uncertainties, such as the weight of evidence of a particular COPC's carcinogenicity in humans.

USEPA guidance (USEPA 1989) specifies that the assessment be accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether studies claim that exposure to a COPC may cause the incidence of an adverse effect. USEPA specifies the dose-response assessment which is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, specific toxicity values are derived by USEPA that can be used to estimate the incidence of potentially adverse effects occurring in humans at different exposure levels (USEPA 1989). Individual toxicological profiles, which present a summary of available toxicological information used in the determination of toxicity values for COPCs, are provided in **Appendix E**. The HHRA utilizes existing toxicity information developed in accordance with USEPA guidance (USEPA 1989 and 2003b). The USEPA has identified a three-tiered approach for selection of toxicity values (USEPA 2003c). Tier 1 values are available from the Integrated Risk Information System (IRIS) (USEPA 2010c). IRIS presents USEPA established, current toxicity values. These toxicity values have undergone peer reviews and USEPA consensus reviews and represent the USEPA scientific position regarding the toxicity of the chemicals based on the data available at the time of the review. When toxicity values are not available from IRIS, Tier 2 values are then examined.

Tier 2 values are USEPA's Provisional Peer Reviewed Toxicity Values, which are developed by the Office of Research and Development, the National Center for Environmental Assessment, and the Superfund Health Risk Technical Support Center on a chemical-specific basis when

[1] The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

requested by the Superfund program. These values have not undergone the rigorous review process as the IRIS toxicity values.

Tier 3, other toxicity values, are considered when Tier 1 or Tier 2 toxicity values are not available. These toxicity values are taken from additional USEPA and non-USEPA sources and are chosen based on the most current and best peer-reviewed source available. Priority is given to sources of information that are the most current, and the basis of the toxicity value is transparent and publicly available. The California EPA (CalEPA) Office of Environmental Health Hazard Assessment Toxicity Criteria Database (CalEPA 2010), the ATSDR Minimal Risk Levels, and the Health Effects Assessment Summary Tables (USEPA 1997c) are the Tier 3 sources utilized for this HHRA.

For this HHRA, two toxicological endpoints are considered: carcinogenic and non-carcinogenic. USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for COPCs are summarized in **Table 5.5.1**. USEPA-derived toxicity values for evaluating potential carcinogenic effects for COPCs are summarized in **Table 5.6**. The following sections detail how each endpoint is determined.

5.3.1 Toxicity Assessment for Non-Carcinogens

Non-carcinogenic endpoints are evaluated through the use of a reference dose, or RfD. For this HHRA only chronic effects are evaluated. A chronic RfD is defined as an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for humans, including sensitive subpopulations, that is likely to be without adverse effects during a lifetime (USEPA 1989). Chronic RfDs are specifically developed to be protective for long-term exposure to a COPC.

The first step in determining RfDs is the determination of the critical study and toxic effect of a chemical. From this study, an experimental exposure level is calculated that represents the highest level tested at which no adverse effects (including the critical toxic effect) are demonstrated. Non-carcinogens are typically judged to have a threshold daily dose below which adverse effects are unlikely to occur. This concentration is called the NOAEL, and is usually derived from either animal laboratory experiments or human epidemiology investigations (usually workplace studies). In developing a toxicity value or human NOAEL for non-carcinogens (i.e., an RfD), the regulatory approach is to: (1) identify the critical toxic effect associated with chemical exposure (i.e., the most sensitive adverse effect); (2) identify the threshold dose in either an animal or human study; and (3) modify this dose to account for interspecies variability (where appropriate), differences in individual sensitivity (within-species variability), and other uncertainty and modifying factors. Specific detail concerning the methodology used by USEPA for deriving non-carcinogenic reference values is discussed further in USEPA guidance (USEPA 2010c). In some toxicological studies, a LOAEL, rather than a NOAEL, is available. The LOAEL represents the lowest exposure level where biologically significant increases in frequency or severity of adverse effects between the exposed population and a control group occur. An RfD can be determined through the use of the LOAEL after adjustment for species differences are applied.

When deriving an RfD from experimental data, uncertainty and modifying factors are usually applied to the LOAEL or NOAEL. The HHRA utilizes existing RfDs from sources identified in the tiered approach presented in Section 5.3. RfDs used in this HHRA already have the appropriate uncertainty and modifying factors applied by the source identified in **Table 5.5.1**. Uncertainty factors are intended to account for specific types of uncertainty inherent in extrapolation from the available data. The modifying factor accounts for the confidence in the scientific studies from which toxicity values are derived, according to such parameters as study quality and study reproducibility. The uncertainty factors are generally 10-fold, default factors used in operationally deriving the RfD from experimental data. Uncertainty factors less than 10 can be used. An uncertainty factor of 3 can be used in place of one-half power ($10^{0.5}$) when appropriate. The uncertainty factors are intended to account for: (1) variation in susceptibility among the members of the human population (i.e., inter-individual or intraspecies variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies uncertainty); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure (i.e., extrapolating from subchronic to chronic exposure); (4) uncertainty in extrapolating from a LOAEL rather than from a NOAEL; and (5) uncertainty associated with extrapolation when the database is incomplete. The maximum uncertainty factor for the derivation of the RfD is 3,000.

A modifying factor ranging from 1 to 10 is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire database not addressed by the uncertainty factors. The default value for the modifying factor is 1. USEPA discontinued the use of the modifying factor in 2004. However, toxicity values for some contaminants, derived before 2004, still contain a modifying factor. To calculate the RfD, the appropriate NOAEL is divided by the product of all the applicable uncertainty factors and the modifying factor. This is expressed as:

$$RfD = NOAEL / (Uncertainty\ Factor_1 \times Uncertainty\ Factor_2 \ldots \times Modifying\ Factor)$$

Where:

RfD	=	Reference dose (mg/kg bw-day)
NOAEL	=	No observed adverse effect level (mg/kg bw-day)

The resulting RfD is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg bw-day).

5.3.2 Toxicity Assessment for Carcinogens

Unlike non-carcinogens, carcinogens are generally assumed to have no threshold. There is presumed to be no level of exposure below which carcinogenic effects will not manifest themselves. This “non-threshold” concept is based on the premise that there are small, finite probabilities of inducing a carcinogenic response associated with every level of exposure to a potential carcinogen. USEPA uses a two-part evaluation for carcinogenic effects. This evaluation includes the assignment of a weight-of-evidence classification and the quantification of a cancer toxic potency concentration. Quantification is expressed as a slope factor (SF) for

oral and dermal exposures, which reflects the dose-response data for the carcinogenic endpoint(s) (USEPA 1989 and 2010c).

The SF converts estimated daily intakes averaged over a lifetime of exposure directly to incremental risk of an individual developing cancer. The SF is the upper 95th percentile confidence limit of the probability of response per unit daily intake of a chemical over a lifetime. The SF is expressed in units of proportion (of a population) affected per mg/kg bw-day. Typically, the SF is used to estimate the upper-bound lifetime probability of a person developing cancer from exposure to a given concentration of a carcinogen. SFs are generally based on experimental animal data, unless suitable epidemiological studies are available. Because of the difficulty in detecting and measuring carcinogenic endpoints at low exposure concentrations, SFs are typically developed by using a model to fit the available high-dose, experimental animal data, and then extrapolating downward to the low-dose range to which humans are typically exposed. USEPA recommends the linear multistage model to derive an SF. The model is conservative and provides an upper bound estimate of excess lifetime cancer risk. These methods and approaches are discussed in greater detail within the USEPA *Cancer Guidelines* (USEPA 2005b).

The weight-of-evidence classification system assigns a letter or alphanumeric (A through E) to each potential carcinogen that reflects an assessment of its potential to be a human carcinogen (USEPA 1989).[2] USEPA has recently established five recommended standard hazard descriptors: "*Carcinogenic to Humans*," "*Likely to Be Carcinogenic to Humans*," "*Suggestive Evidence of Carcinogenic Potential*," "*Inadequate Information to Assess Carcinogenic Potential*," and "*Not Likely to Be Carcinogenic to Humans*" (USEPA 2005b). The weight-of-evidence classification is based on a thorough scientific examination of the body of available data. Only compounds that have a weight-of-evidence classification of C or above are considered to have carcinogenic potential in this HHRA.

COPCs that are determined to have sufficient weight of evidence for carcinogenic endpoints are also assessed for mutagenic modes of action. The mutagenic mode of action is assessed with a linear approach (USEPA 2005b). **Table 5.6** identifies the COPCs with a mutagenic mode of action. COPCs identified as mutagenic have sensitivity pertaining to cancer risks associated with early-life exposures. To account for the early-life exposure and the mutagenic mode of action, the cancer potency estimates are adjusted. USEPA recommends, for mutagenic chemicals, when no chemical-specific data exist, a default approach using estimates from chronic studies (i.e., cancer slope factors) with appropriate modifications to address the potential for differential risk of early-life stage exposure (USEPA 2005b,c). A modification for early-life stage exposure to mutagenic COPCs is required because available studies indicate higher cancer risks resulting from a given exposure occurring early in life when compared with the same amount of exposure during adulthood (USEPA 2005b). For this HHRA, the SFs for COPCs identified with a mutagenic mode of action are modified for the following (USEPA 2005c):

[2] A = a known human carcinogen; B1 = a probable human carcinogen, based on sufficient animal data and limited human data; B2 = a probable human carcinogen based on sufficient animal data and inadequate or no human data; C = a possible human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of non-carcinogenicity for humans.

- For exposures between 3 and 16 years of age, a 3-fold adjustment is made.
- For exposures after turning 16 years of age, no adjustment is made.

5.3.3 Modifications for Dermal Contact

Toxicity values specific to dermal exposures are not available and require adjustment of the oral toxicity values (oral RfDs or SFs). This adjustment accounts for the difference between the daily intake doses through dermal contact as opposed to ingestion. Most toxicity values are based on the actual administered dose and must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to use in dermal contact risk assessment (USEPA 1989 and 2004). USEPA recommends utilizing oral absorption efficiency factors in converting oral toxicity values to dermal toxicity values (USEPA 2004). This adjustment accounts for the absorption efficiency in the "critical study," which is utilized in determining the RfD and SF. Where oral absorption in the critical study is essentially complete (i.e., 100 percent), the absorbed dose is equivalent to the administered dose, and no adjustment of oral toxicity values is necessary when evaluating dermal exposures. When gastrointestinal absorption of a chemical in the critical study is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose, and toxicity values for dermal exposure are adjusted to account for the difference in the absorbed dose relative to the administered dose. To account for the differences between the administered (oral) and the absorbed (dermal) dose, RfDs and SFs are modified by the gastrointestinal dermal absorption factor (GIABS).

In addition to the GIABS modification of the toxicity values for dermal contact, dermal contact rates are also evaluated based upon a chemical's ability to be absorbed through the skin surface. This absorption rate is dependent upon the medium evaluated. For sediments, USEPA has identified a dermal absorption factor (ABS) that is chemical-specific. The ABS value reflects the desorption of a chemical from sediment and the absorption of the chemical across the skin and into the blood stream. The USEPA-recommended ABS values are based upon available experimental data for dermal absorption from contaminated soil (USEPA 2003c, 2004). Recommended values are presented that account for uncertainty which may arise from different soil types, loading rates, chemical concentrations, and other conditions.

For surface water, dermal exposures are adjusted by two methods. For organics the dermal exposures are adjusted by the fraction absorbed (FA), permeability coefficient (PC), and the exposure time. The FA accounts for chemical loss due to shedding during absorption from the skin to the bloodstream, the PC represents the ability of a chemical to cross the stratum corneum, and exposure time is used to determine the diffusion of the compound across the skin to accurately determine the dose dissolved into the bloodstream. Inorganic Compounds are adjusted by the PC only.

The chemical-specific parameters utilized in assessing dermal exposure, GIABS, ABS, FA, and PC are selected from the USEPA dermal guidance (USEPA 2003c, 2004). Additional chemical-specific parameters not provided in the latest USEPA guidance are taken from the Toxicity and Chemical-Specific Factors Database (U.S. Department of Energy [USDOE] 2010), which is

updated regularly. **Table 5.5.2** presents relative chemical-specific parameters utilized in calculating dermal exposure for COPCs.

5.4 RISK CHARACTERIZATION

In the risk characterization, the chemical intakes (Section 5.2) and toxicity values (Section 5.3) are summarized and integrated into quantitative expressions of risk. The risk characterization results in a numerical expression of risk for human contact with COPCs in media of concern. Non-carcinogenic and carcinogenic effects are calculated for recreational users and commercial watermen. To characterize potential non-carcinogenic effects, comparisons are made between chemical intakes and toxicity values. For potential carcinogenic effects, incremental probabilities that a receptor will develop cancer over a lifetime of exposure are estimated from chemical intakes and chemical-specific dose-response information. The risk characterization is performed following USEPA guidance (USEPA 1989). The following text details the risk characterization methodology. There are separate discussions for carcinogenic and non-carcinogenic effects because the methodology differs for these two modes of chemical toxicity.

5.4.1 Hazard Index for Non-Carcinogenic Effects

The potential human health risks associated with exposures to non-carcinogenic COPCs are estimated by comparing the ADI with the chemical-specific RfD, as per USEPA Guidance (USEPA 1989). A HQ is derived for each COPC, as shown in the equation below:

$$HQ = \frac{ADI}{RfD}$$

Where:

HQ	=	Hazard Quotient; ratio of average daily intake level to acceptable daily intake level (unitless)
ADI	=	Estimated non-carcinogenic average daily intake (mg/kg bw-day)
RfD	=	Reference dose (mg/kg bw-day)

If the average daily dose exceeds the RfD, the HQ exceeds a ratio of one (1) and there may be concern that potential adverse systemic health effects would be observed in the exposed populations. Per input from USEPA, ratios below 1.5 are considered acceptable because these round to 1 (USEPA 2011b). If the ADI does not exceed the RfD, the HQ does not exceed 1 and there is no concern that potential adverse systemic health effects would be observed in the exposed populations. However, if the sum of several HQs exceeds 1, and the COPCs affect the same target organ, there may be concern that potential adverse systemic health effects would be observed in the exposed populations. In general, the higher the HQ is above 1, the greater the level of concern. However, the HQ does not represent a statistical probability that an adverse health effect would occur.

For consideration of exposures to more than one chemical causing systemic toxicity via several different pathways, the individual HQs are summed to provide an overall hazard index (HI). If

the HI is less than 1, then no adverse health effects are likely to be associated with exposures at the offshore area. Per input from USEPA, HIs below a target level of 1.5 are considered acceptable because these would round to 1 (USEPA 2011b). However, if the total HI is greater than the target level, separate endpoint-specific HIs may be calculated based on toxic endpoint of concern or target organ (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if an endpoint-specific HI is greater than the target level is there reason for concern about potential health effects for that endpoint.

5.4.2 Carcinogenic Risks

Carcinogenic risk is estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The numerical estimate of excess lifetime cancer risk is calculated by multiplying the LADI by the risk per unit dose (SF). This is shown in the following equation:

$$Risk = LADI \times SF$$

Where:

Risk	=	Unitless probability of an exposed individual developing cancer
LADI	=	Lifetime incremental cancer average daily intake (mg/kg bw-day)
SF	=	Cancer slope factor $(mg/kg\ bw\text{-}day)^{-1}$

Because the SF is the statistical 95th percent upper-bound confidence limit on the dose-response slope, this method provides a conservative, upper-bound estimate of risk.

It should be noted that the interpretation of the significance of the carcinogenic risk estimate is based on the appropriate public policy. USEPA in the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300) (USEPA 1990) states that:

> *"...For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}."*

5.5 RISK CHARACTERIZATION RESULTS

Risk characterization calculations are presented in **Tables 5.7.1** through **5.7.4** for the Coke Point Offshore Area. **Tables 5.7.5** through **5.7.8** present the risk characterization calculations for the Patapsco River Background Area. **Tables 5.7.9** through **5.7.12** present calculation of the dermal absorbed dose from surface water. To assess the potential health effects of more than one chemical (both carcinogens and non-carcinogens), risk characterization results are summed across each medium of concern. The summation assumes dose additivity in the absence of information on specific mixtures of chemicals (USEPA 1989). In addition, risk characterization results are summed across all pathways to determine a cumulative result for total exposure to the Coke Point Offshore Area and the Patapsco River Background Area.

An adjustment is made to the arsenic EPC in **Tables 5.7.1** through **5.7.8** in fish and crabs to account for the actual percentage of inorganic arsenic in fish tissue and crab meat (**Table 5.1**). Arsenic speciation was performed for field-collected fish (white perch) and crab tissue and mustard. As discussed in Section 5.1, an average percentage of inorganic arsenic for both the Coke Point Offshore Area and the Patapsco River Background Area is established at 10.4 percent (**Table 5.1**).

Tables 5.9.1 through **5.9.8** present the estimates of cumulative excess risks across all pathways for non-carcinogenic and carcinogenic effects for all receptors. A risk summary of COPCs that contribute significantly to risks is presented in **Tables 5.10.1** through **5.10.8**. COPCs are only identified on **Tables 5.10.1** through **5.10.8** if cumulative carcinogenic risks are greater than the target risk range of 10^{-6} to 10^{-4} or cumulative non-carcinogenic risks are greater than 1.0. These tables present only the COPCs that contribute carcinogenic risks greater than 10^{-6} or non-carcinogenic risks greater than 0.1.

5.5.1 Adult Recreational User Results

The adult recreational user is evaluated for dermal exposure to surface water and surface sediment, incidental ingestion of surface water, and ingestion of field-collected fish and crabs. Risk calculations are presented in **Table 5.7.1**. A risk summary for this receptor is provided in **Table 5.9.1**, and a presentation of contributors to risk (carcinogenic risk greater than $1x10^{-6}$ or a HQ greater than 0.1) is provided in **Table 5.10.1**.

5.5.1.1 Coke Point Offshore Area Adult Recreational User Results

Non-Carcinogenic Results

The total calculated non-carcinogenic HI for the adult recreational user is 1.2. The ingestion of crab pathway is the primary contributor to the non-carcinogenic HI. The estimated HI for surface water exposure is 0.0005. The estimated HI for ingestion of fish for the Coke Point Offshore Area is 0.1. The estimated HI for surface sediment exposure is 0.0008. The estimated HI for ingestion of crabs for the Coke Point Offshore Area is 1.1. A breakdown by target organ is provided on **Table 5.10.1**. No COPC or target organ has an HQ greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adult recreational user is 2.3×10^{-4}. The estimated risk for surface water exposure is 1.1×10^{-4}. The estimated risk for adult recreational user ingestion of fish for the Coke Point Offshore Area is 2.9×10^{-5}. The estimated risk for surface sediment exposure is 3.4×10^{-7}. The estimated risk for ingestion of crab for the Coke Point Offshore Area is $8.8x\ 10^{-5}$. No COPC has excess cancer risk above 10^{-4}.

5.5.1.2 Patapsco River Background Adult Recreational User Results

Patapsco River background risk calculations are presented in **Table 5.7.5** for the adult recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 5.9.5**, and

a presentation of contributors to risk (carcinogenic risk greater than $1x10^{-6}$ or a HQ greater than 0.1) is provided in **Table 5.10.5**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adult recreational user is 0.6. The estimated HI for surface water exposure is 0.0002. The estimated HI for adult recreational ingestion of fish as modeled for the Patapsco River Background Area is 0.2. The estimated HI for surface sediment exposure is 0.00009. The estimated HI for adult recreational ingestion of crab as modeled for the Patapsco River Background Area is 0.4.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adult recreational user is 9.8×10^{-5}. The estimated risk for surface water exposure is 7.1×10^{-6}. The estimated risk for adult recreational ingestion of fish for the Patapsco River Background Area is 4.1×10^{-5}. The estimated risk for surface sediment exposure is 2.9×10^{-8}. The estimated risk for adult recreational ingestion of crab for the Patapsco River Background Area is 5.0×10^{-5}.

5.5.2 Adolescent Recreational User Results

The adolescent recreational user is evaluated for dermal exposure to surface water and surface sediment, ingestion of surface water, and ingestion of fish and crab. Risk calculations are presented in **Table 5.7.2**. A risk summary for this receptor is provided in **Table 5.9.2**, and a presentation of contributors to risk (carcinogenic risk greater than 1×10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.2**.

5.5.2.1 Coke Point Offshore Area Adolescent Recreational User Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent recreational user is 1.4. The ingestion of crab pathway is the primary contributor to the non-carcinogenic HI. The estimated HI for surface water exposure is 0.0006. The estimated HI for ingestion of fish for the Coke Point Offshore Area is 0.2. The estimated HI for surface sediment exposure is 0.004. The estimated HI for ingestion of crab for the Coke Point Offshore Area is 1.3. A breakdown by target organ is provided on **Table 5.10.2**. The developmental system has an HI of one 1. No COPC has an HQ greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adolescent recreational user is 1.8×10^{-4}. The estimated risk for surface water exposure is 1.3×10^{-4}. The estimated risk for ingestion of fish for the Coke Point Offshore Area is 1.1×10^{-5}. The estimated risk for surface sediment exposure is 1.4×10^{-6}. The estimated risk for ingestion of crab for the Coke Point Offshore Area is 3.7×10^{-5}. No COPCs represent excess cancer risk above 10^{-4}.

5.5.2.2 Patapsco River Background Adolescent Recreational User Results

Patapsco River background risk calculations are presented in **Table 5.7.6** for the adolescent recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 5.9.6**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.6**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent recreational user is 0.6. The estimated HI for surface water exposure is 0.0002. The estimated HI for ingestion of fish for the Patapsco River Background Area is 0.2. The estimated HI for surface sediment exposure is 0.0004. The estimated HI for ingestion of crab for the Patapsco River Background Area is 0.4.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adolescent recreational user is 4.3 x 10^{-5}. The estimated risk for surface water exposure is 8.2 x 10^{-6}. The estimated risk for ingestion of fish for the Patapsco River Background Area is 1.6 x 10^{-5}. The estimated risk for surface sediment exposure is 9.9 x 10^{-8}. The estimated risk for ingestion of crab for the Patapsco River Background Area is 1.9 x 10^{-5}.

5.5.3 Child Recreational User Results

The child recreational user is evaluated for dermal exposure to surface water and surface sediment, ingestion of surface water, and ingestion of fish and crab. Risk calculations are presented in **Table 5.7.3**. A risk summary for this receptor is provided in **Table 5.9.3**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.3**.

5.5.3.1 Coke Point Offshore Area Child Recreational User Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the child recreational user is 1.8. The ingestion of crab pathway is the primary contributor to the non-carcingenic HI. The estimated HI for surface water exposure is 0.0007. The estimated HI for ingestion of fish for the Coke Point Offshore Area is 0.2. The estimated HI for surface sediment exposure is 0.006. The estimated HI for ingestion of crab for the Coke Point Offshore Area is 1.6. A breakdown by target organ is provided on **Table 5.10.3**. The developmental system has an HI slightly greater than 1, which is entirely attributable to dioxin. It is noted that the results for dioxin are based upon literature-based BAFs for sediment and do not represent actual crab concentrations. Field-collected crab tissue samples were not analyzed for dioxin.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the child recreational user is 6.8 x 10^{-5}. The estimated risk for surface water exposure is 4.9 x 10^{-5}. The estimated risk for ingestion of fish for the Coke Point Offshore Area is 4.2 x 10^{-6}. The estimated risk for surface sediment exposure is 7.3 x 10^{-7}. The estimated risk for ingestion of crab for the Coke Point Offshore Area is 1.4 x 10^{-5}.

5.5.3.2 Patapsco River Background Child Recreational User Results

Patapsco River background risk calculations are presented in **Table 5.7.7** for the child recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 5.9.7**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.7**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the child recreational user is 0.8. The estimated HI for surface water exposure is 0.0002. The estimated HI for ingestion of fish for the Patapsco River Background Area is 0.3. The estimated HI for surface sediment exposure is 0.0007. The estimated HI for ingestion of crab for the Patapsco River Background Area is 0.5.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the child recreational user is 1.6 x 10^{-5}. The estimated risk for surface water exposure is 3.0 x 10^{-6}. The estimated risk for ingestion of fish for the Patapsco River Background Area is 5.9 x 10^{-6}. The estimated risk for surface sediment exposure is 5.0 x 10^{-8}. The estimated risk for ingestion of crab for the Patapsco River Background Area is 7.2 x 10^{-6}.

5.5.4 Watermen Results

Watermen are evaluated for dermal exposure to surface water and surface sediment, and ingestion of fish and crab. Risk calculations are presented in **Table 5.7.4**. A risk summary for this receptor is provided in **Table 5.9.4**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.4**.

5.5.4.1 Coke Point Offshore Area Watermen Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the watermen is 1.5. The ingestion of crab pathway is the primary contributor to non-carcinogenic HI. The estimated HI for surface water exposure is 0.0009. The estimated HI for watermen ingestion of fish for the Coke Point Offshore Area is 0.2. The estimated HI for surface sediment exposure is 0.02. The estimated HI for watermen ingestion of crab for the Coke Point Offshore Area is 1.4. A breakdown by target organ is provided on **Table 5.10.4**. The developmental system has an HI slightly greater than 1, which is entirely attributable to dioxin. It is noted that the results for dioxin are based upon literature-

based BAFs for sediment and do not represent actual crab concentrations. Field-collected crab tissue samples were not analyzed for dioxin.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the watermen is 4.0 x 10^{-4}. The estimated risk for surface water exposure is 2.4 x 10^{-4}. The estimated risk for watermen ingestion of fish for the Coke Point Offshore Area is 3.6 x 10^{-5}. The estimated risk for surface sediment exposure is 9.6 x 10^{-6}. The estimated risk for watermen ingestion of crab for Coke Point Offshore Area is 1.1 x 10^{-4}. The PAH, dibenz(a,h)anthracene, in surface water has excess cancer risk above 10^{-4}.

5.5.4.2 Patapsco River Background Watermen Results

Patapsco River Background Area risk calculations are presented in **Table 5.7.8** for watermen. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 5.9.8**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 5.10.8**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the watermen is 0.7. The estimated HI for surface water exposure is 0.0003. The estimated HI for watermen ingestion of fish for the Patapsco River Background Area is 0.2. The estimated HI for surface sediment exposure is 0.003. The estimated HI for watermen ingestion of crab for the Patapsco River Background Area is 0.5.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the watermen is 1.3 x 10^{-4}. The estimated risk for surface water exposure is 1.5 x 10^{-5}. The estimated risk for watermen ingestion of fish for the Patapsco River Background Area is 5.0 x 10^{-5}. The estimated risk for surface sediment exposure is 8.0 x 10^{-7}. The estimated risk for watermen ingestion of crab for the Patapsco River Background Area is 6.1 x 10^{-5}.

5.6 UNCERTAINTY EVALUATION

There are numerous uncertainties involved in the HHRA process. These are discussed briefly in the following sections. There are uncertainties associated with each step of the risk assessment process: Sampling and analysis, exposure assessment, exposure point concentration, dermal exposure values, toxicity assessment, and risk characterization. Where uncertainties are inherent in the USEPA guidance for the HHRA process and the USEPA has recommended or incorporated methods for addressing these uncertainties, the agency's findings have been incorporated into the HHRA. This is particularly true for uncertainties associated with the toxicity assessment and exposure routes. For the toxicity assessment, appropriate uncertainty factors are applied to toxicity values as set forth by the USEPA and discussed in Section 5.3 (USEPA 2010c). Where uncertainties are specifically associated with the design of this risk assessment, sensitivity analyses were conducted to better understand their significance (**Appendix G**).

5.6.1 Sampling and Analysis Uncertainties

The sampling plan can have a significant impact on the results obtained in calculating human health risks at a site. There are uncertainties associated with the data set used in the HHRA. In particular, surface water is a fluid medium and chemical concentrations may vary spatially and temporally. Uncertainty due to spatial and temporal variability is especially relevant to surface water results because surface water is subject to mixing and variable upstream input. To mitigate this uncertainty, sampling was designed specifically to provide data relevant to the HHRA. Sampling efforts targeted areas of suspected chemical contamination and the spatial resolution was selected to provide relevant results. Multiple depths and repeat sampling events were used to reduce variability in surface water. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**

There is uncertainty associated with the use of data from multiple studies. To reduce this uncertainty, data from each study was reviewed for relevance and only validated, relevant data were utilized (as discussed in Section 3.1). It should be noted that data are available from other studies of the area that were not utilized in the HHRA due to uncertainties associated with differences in study design, analytical methods, or data validation. In specific, data from a 2005 study of VOCs in surface water by Severstal were not included because they utilized a different study design, a limited analytical suite, and were not validated. Benzene concentrations from samples in this study ranged from non-detect to 0.330 mg/L. These concentrations are higher than those detected in the sampling conducted to support the HHRA, which ranged from non-detect to 0.072 mg/L. These differences in chemical concentrations over time are a source of uncertainty.

There is also uncertainty associated with samples used to represent the Patapsco River Background Area. Background samples for surface sediment demonstrated substantial variability, with a range of concentrations for metals and PAHs, frequently spanning an order of magnitude. Given the variety of environments and potential sources to background, this is not necessarily unexpected. Because insufficient background samples were available to calculate a 95% UCLM, the maximum concentration in background sediment was used to represent the reasonable maximum exposure scenario. Interpretation of comparisons to background results should consider this conservative fact. To mitigate uncertainties associated with data for the Patapsco River Background Area, background concentrations are compared to concentrations in other far field samples in the Patapsco River. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

There are also uncertainties associated with field-collection of fish and crab tissue. Collection of tissue in a single event may not account for variability in concentrations over long periods of time due to seasonal variation, migration, or changing site conditions. This may result in over- or under- estimation of risks. To minimize these uncertainties, individual specimens were collected and composited using sampling criteria that help minimize the impacts of variation as detailed further in **Appendix H**.

There is also uncertainty associated with the concentrations of metals detected in the surface water samples from the investigation area. All of the surface water data included in the

quantitative risk calculations were from unfiltered samples. As a result, the concentration of metals detected in surface water samples very likely include metals that are sorbed to suspended particulate matter (sediment). These sorbed metals are less available for uptake by receptors of concern. Therefore, the detected concentrations may not be representative of the amount of bioavailable metals, and the use of these water pathway data could overestimate the potential for risk from surface water related to metals.

5.6.2 Uncertainties Analysis of Exposure Assessment

An analysis of uncertainties is an important aspect of the exposure assessment. It provides the risk assessor and reviewer with information relevant to the individual uncertainties associated with exposure factor assumptions and their potential impact on the final assessment.

Conservative assumptions are made about exposure to these media that may result in an overestimate of potential health risks. The assumption that fishing and swimming occur with a long-term regularity in the offshore environment of this industrialized area is conservative. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

5.6.3 Exposure Point Concentrations

An uncertainty exists with the basic approach used in arriving at EPCs for the COPCs. The USEPA ProUCL program eliminates many uncertainties associated with EPC calculation; however, COPCs with low frequencies of detection still have uncertainties within ProUCL. For the Patapsco River Background Area, both the surface water and sediment dataset had less than 10 samples which prevented the calculation of a 95%UCLM for most chemicals. For most chemicals detected in the Patapsco River Background Area, the results are comparable to the MDL not the RL. The RL is used in the 95%UCLM calculation. Characterization of background EPCs is further evaluated in **Appendix G**, Sensitivity Analysis. In addition, potential human health risks associated with the use of the median concentration as the EPC are also presented in the Sensitivity Analysis, **Appendix G**.

As discussed in Section 5.6.1, there is potential variability in the sampling and analysis of the offshore areas. These variabilities can also affect the calculation of EPCs. EPCs for field-collected fish and crab tissue are based upon the results of 5 composite samples per area evaluated. Additionally, all chemical concentrations in fish tissue and dioxin, tributyltin, VOCs, and SVOCs in crab tissue are modeled from literature-based BAFs.

5.6.4 Dermal Exposure Values

A variable used in the dermal exposure to sediment is the AF. The HHRA used the soil AFs for all receptor exposure to sediment. This is conservative because it is expected that most sediments contacted in the Coke Point Offshore Area would wash off and not stay on the skin area for extended periods of time. As a result, the conservative dermal exposure parameters used in the HHRA would compensate for any chemicals not assessed due to a lack of USEPA-recommended values.

The estimation of dermal exposure to surface water also contains a number of uncertainties that can affect the overall risk results. In estimating dermal exposure to surface water, a primary variable in the calculations is the PC. For organic chemicals, the PC is a function of the path length of chemical diffusion (the thickness of the stratum corneum), the membrane/vehicle partition coefficient of a chemical (the octanol/water partition coefficient, K_{ow}), and the effective diffusion coefficient for chemical transfer through the stratum corneum. The USEPA notes that chemicals with very large K_{ow} values are outside of an "Effective Prediction Domain" (EPD). The PAHs are a primary class of chemicals detected in surface water and have a very larger K_{ow}. Therefore, the predicted PC used in the dermal exposure calculations is not within the EPD and cannot be verified by statistical analysis. The use of the predicted PC in the dermal exposure calculations results in a potential over-estimation of potential risks to receptors.

In addition, the estimation of dermal exposures assumes that absorption of chemicals continues long after exposure has ended. Therefore, the final absorbed dose (DA_{event}) is the total dose dissolved in the skin at the end of exposure. Chemicals that are lipophilic or exhibit a long lag time are assumed that some of the chemical absorbed into the skin is lost due to skin shedding (desquamation). To account for this loss, the dermal exposure model takes into account a fraction absorbed (FA). For a majority of the PAHs evaluated in the HHRA, the FA is assumed at 100 percent. The assumption that 100 percent of the chemical is absorbed may lead to an over-estimation of the dermal exposure to surface water risk results.

5.6.5 Uncertainties of Toxicity Assessment

There are numerous uncertainties associated with the toxicity assessment. These are generally due to the unavailability of data to thoroughly calculate the toxicity of COPCs. These uncertainties are described in more detail in the following sections.

5.6.5.1 Uncertainties Associated With Non-Carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information comes from experiments with laboratory animals. Experimental animal data have been relied on by regulatory agencies to assess the hazards of chemical exposures to humans. Interspecies differences in chemical absorption, metabolism, excretion, and toxic response are not well understood; therefore, conservative assumptions are applied to animal data when extrapolating to humans. These probably result in an overestimation of toxicity.

Intraspecies Extrapolation

Differences in individual human susceptibilities to the effects of chemical exposures may be caused by such variables as genetic factors (e.g., glucose-6-phosphate dehydrogenase deficiency), lifestyle (e.g., cigarette smoking and alcohol consumption), age, hormonal status (e.g., pregnancy), and disease. To take into account the diversity of human populations and their differing susceptibilities to chemically induced injury or disease, a safety factor is used. USEPA uses a factor between 1 and 10. This uncertainty may lead to overestimates of human health effects at given doses.

Exposure Routes

When experimental data available on one route of administration are different from the actual route of exposure that is of interest, route-to-route extrapolation must be performed before the risk can be assessed. Several criteria must be satisfied before route-to-route extrapolation can be undertaken. The most critical assumption is that a chemical injures the same organ(s) regardless of route, even though the injury can vary in degree. Another assumption is that the behavior of a substance in the body is similar by all routes of contact. This may not be the case when, for example, materials absorbed via the gastrointestinal tract pass through the liver prior to reaching the systemic circulation, whereas by inhalation the same chemical will reach other organs before the liver. However, when data are limited, these extrapolations are made and may result in overestimates of human toxicity.

5.6.5.2 Uncertainties Associated With Carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information for carcinogenic assessments comes from experiments with laboratory animals. There is uncertainty about whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a very small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animal species but not in others raises the possibility that not all animal carcinogens are human carcinogens. Regulatory agencies assume that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimation of risk, introduces the potential to overestimate carcinogenic risk.

High-Dose to Low-Dose Extrapolation

Typical cancer bioassays provide limited low-dose data on responses in experimental animals for chemicals being assessed for carcinogenic or chronic effects. The usual dose regime involves three dose groups per assay. The first dose group is given the highest dose that can be tolerated, the second is exposed to one-half that dose, and the third group is unexposed (control group). Because this dosing method does not reflect how animals would react to lower doses of a chemical, a dose-response assessment normally requires extrapolation from high to low doses using mathematical modeling that incorporates to varying degrees information about physiologic processes in the body.

A central problem with the low-dose extrapolation models is that they all too often fit the data from animal bioassays equally well, and it is not possible to determine their validity based on goodness of fit. Several models may fit experimental data equally well, but all may not be equally plausible biologically. The dose-response curves derived from different models diverge substantially in the dose range of interest. Therefore, low-dose extrapolation is more than a curve-fitting process, and considerations of biological plausibility of the models must be taken into account before choosing the best model for a particular set of data.

5.6.6 Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation; the exposure assessment process, including any modeling of exposure point concentrations in secondary media from primary media; and the toxicity assessment process. The individual uncertainties in these respective processes are addressed in previous sections. Another uncertainty in the risk characterization is the summation of chemical-specific risk results across media of concern. The summation assumes an additive effect across media and all exposure pathways for each receptor. However, the summation does not take into account certain aspects. For carcinogenic risks, the summation does not take into account the weight of evidence of carcinogenicity, SFs derived from animal data are given the same weight as SFs derived from human data, and the action of two different carcinogens might not be independent. For non-carcinogenic hazards, the uncertainty of summing across media of concern is reduced through the use of target organ endpoints. In addition, cumulative risk results are provided for each receptor that sum risks across all media of concern. This presents an uncertainty because receptors may not contact all media of concern while in the offshore area.

5.7 HHRA FOR PUBLIC HEALTH IMPACTS SUMMARY

The HHRA–PH evaluates the potential cumulative risks for the adult recreational user, adolescent recreational user, child recreational user, and watermen for exposure to surface water, sediment, and fish and crab concentrations. Specific pathways evaluated are presented in **Figure 2.2**. The HHRA-PH evaluated both the Coke Point Offshore Area and the Patapsco River Background Area.

The HHRA-PH characterizes human exposures given the current conditions of the offshore area. Currently, the offshore area around Coke Point is not expected to be frequently for swimming or other water activities, and it is expected that people would visit other, more easily accessible areas available in close proximity to Coke Point Offshore Area (e.g., state parks, private docks, etc.). However, there are no controls against these activities, so there is a potential for these activities. This exposure scenario takes into account exposures modeled in previous RCRA investigations and consultation with site-specific USEPA and MDE inputs (ISG 2005 and USEPA/MDE 2011a). The HHRA-PH provides an estimate of a site-specific exposure that takes into account the mobility of aquatic organisms in the offshore area by evaluating sample results from studies of field-collected crab and fish tissue. The results of the HHRA-PH provide a long-term risk characterization of the people fishing/crabbing in the area under current conditions.

The following tables present a summary of the HHRA-PH risk results:

Risk Assessment for Public Health Impacts
Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$3.4x10^{-7}$	$1.1x10^{-4}$	$8.8x10^{-5}$	$2.9x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.4x10^{-6}$	$1.3x10^{-4}$	$3.7x10^{-5}$	$1.1x10^{-5}$	$1.8x10^{-4}$
Child Recreational User	$7.3x10^{-7}$	$4.9x10^{-5}$	$1.4x10^{-5}$	$4.2x10^{-6}$	$6.8x10^{-5}$
Watermen	$9.6x10^{-6}$	$2.4x10^{-4}$	$1.1x10^{-4}$	$3.6x10^{-5}$	$4.0x10^{-4}$
Patapsco River Background Area					
Adult Recreational User	$2.9x10^{-8}$	$7.1x10^{-6}$	$5.0x10^{-5}$	$4.1x10^{-5}$	$9.8x10^{-5}$
Adolescent Recreational User	$9.9x10^{-8}$	$8.2x10^{-6}$	$1.9x10^{-5}$	$1.6x10^{-5}$	$4.3x10^{-5}$
Child Recreational User	$5.0x10^{-8}$	$3.0x10^{-6}$	$7.2x10^{-6}$	$5.9x10^{-6}$	$1.6x10^{-5}$
Watermen	$8.0x10^{-7}$	$1.5x10^{-5}$	$6.1x10^{-5}$	$5.0x10^{-5}$	$1.3x10^{-4}$

Risk Assessment for Public Health Impacts
Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.0008	0.0005	1.1	0.1	1.2
Adolescent Recreational User	0.004	0.0006	1.3	0.2	1.4
Child Recreational User	0.006	0.0007	1.6	0.2	1.8
Watermen	0.02	0.0009	1.4	0.2	1.5
Patapsco River Background Area					
Adult Recreational User	0.00009	0.0002	0.4	0.2	0.6
Adolescent Recreational User	0.0004	0.0002	0.4	0.2	0.6
Child Recreational User	0.0007	0.0002	0.5	0.3	0.8
Watermen	0.003	0.0003	0.5	0.2	0.7

Cumulative carcinogenic risk results are above the USEPA carcinogenic target levels for all receptors, except the child recreational user. Non-carcinogenic hazards exceed USEPA target levels for only the child recreational user. Dermal exposure to surface water is the primary contributor to cumulative carcinogenic risk results. Consumption of crab and fish also contribute to excess carcinogenic risk results. However, the carcinogenic results for the consumption of crab and fish are comparable to the results for the Patapsco River Background Area. Non-carcinogenic hazards are primarily from the consumption of crab tissue. **Tables 5.10.1** through **5.10.4** present the COPCs that contribute to calculated risk for the Coke Point Offshore Area. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in surface water are the primary contributors to overall cumulative risks. Dioxin are the primary

contributor to non-carcinogenic hazards. It is noted that the risk results for dioxin are based upon a BAF modeled exposure and are not a result of field-collected tissue samples.

For the Patapsco River Background Area, cumulative carcinogenic risk results are acceptable based upon USEPA guidance. In addition, non-carcinogenic hazards are below the target level. For the Patapsco River Background area, the consumption of crab and fish tissue are the primary contributors to overall cumulative carcinogenic risks. **Tables 5.10.5** through **5.10.8** present the chemicals that contribute to calculated risks for the Patapsco River Background Area. Total PCBs in field-collected fish and crab tissue are a primary contributor to carcinogenic risk results for the Patapsco River Background Area.

The results of the HHRA-PH reveal that the Coke Point Offshore Area contributes potential human health risks above the Patapsco River Background Area. Elevated risk levels are primarily a result of potential exposures to sediment and surface water along the shoreline of the Coke Point Offshore Area. The carcinogenic results for the consumption of crab and fish are comparable to the results for the Patapsco River Background Area. However, the chemicals that contribute significantly to risk results differ according to the area evaluated. PAHs are the primary contributor to fish tissue in the Coke Point Offshore Area. Total PCBs are the primary contributors to consumption of crab tissue risks for both the Coke Point Offshore Area and the Patapsco River Background Area.

A primary contributor to cumulative carcinogenic risks is the dermal contact with surface water exposure pathway. The risk results for this pathway present a number of uncertainties that need to be taken into account in any risk management decisions. PAHs are the only class of chemicals that contribute to the carcinogenic risks determined for the surface water exposure pathway. The USEPA dermal guidance (USEPA 2004) notes that the PCs (permeability coefficients) estimated for PAHs are outside of a predictive range and cannot be verified. As a result, the actual absorbed dose of PAHs through the skin is most likely over-estimated. Additionally, the surface water exposure pathway also estimates potential risks for exposure to the entire offshore study area around the Coke Point Peninsula, including water within the turning basin and along the Coke Point shoreline. The use of the USEPA ProUCL program takes into account sample results over the entire exposure area to eliminate some uncertainty and determine the concentration contacted over the entire area, including samples with non-detects. However, actual PAH detections in surface water are spatially limited. **Figures 3.13** through **3.15** in the risk assessment present the detected PAH concentrations, as represented by benzo(a)pyrene. PAHs are highest in surface water locations immediately offshore of Coke Point Peninsula at locations BH-W-06 and BH-W-10B. These locations are not expected to attract recreational swimmers based on current site conditions. Furthermore, surface water PAH detections are not consistently detected throughout the study area which is a result of typical surface water movement and influences from other conditions, including groundwater discharge, tidal flow, etc. Due to these limitations, potential carcinogenic risks for dermal contact with surface water are likely over-estimated. The results of the HHRA should be used in context with the known groundwater contamination discharge to surface water to determine risk management decisions for potential human health concerns and potential project design. The Site Assessment noted that impacted groundwater fluxes from the northwestern and eastern parts of the Coke Point Peninsula to the adjacent Patapsco River and Turning Basin. This discharge of groundwater to surface water has

negatively affected surface water quality (EA 2009b). Additionally, sediments along the Coke Point shoreline are impacted with residual NAPL and are have the potential to be disturbed along the shoreline by wave action (EA 2009b). Both factors could potentially contribute elevated concentrations of PAHs to surface water and act as a continual source.

6. HUMAN HEALTH RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

As noted in Section 5, potential human health risks are evaluated for the offshore area in two separate HHRAs. Section 5 evaluates the offshore area based upon the current conditions of the offshore area. This section presents the HHRA-SC, and it provides an evaluation of human health risks that will aid in the MPA with internal decision making for future site planning and determining potential remediation requirements. The HHRA-SC provides a theoretical maximum exposure that provides conservative indication of potential contribution from offshore sediment and surface water. The HHRA-SC focuses on exposures limited to the Coke Point Offshore Area and analyze crab and fish consumption based on site-specific data. The HHRA-SC relies on site-specific bioaccumulation studies to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption. Potential receptor exposure to surface water, sediment, modeled fish tissue, and modeled crab tissue are evaluated. This HHRA evaluates potential risk contributions specifically from the offshore area evaluated without regard to the actual use of the area.

The HHRA quantitatively evaluates the complete exposure pathways identified in the CSM (Chapter 2) for potential long-term risk concerns for human health. The HHRA is a process in which exposure and toxicity data are combined to develop an estimate of the potential for adverse impacts on human receptors from chemicals in the environment. The HHRA determines baseline risks associated with long-term exposure to the Coke Point Offshore Area. The baseline risk does not take into account any remedial actions or other means of exposure reduction (e.g., the use of personal protective equipment, fishing restrictions, etc.). In addition, future potential risk associated with changes at the site (i.e., dredging or erosion) is not evaluated in the HHRA.

The HHRA specifically follows the analysis methods set forth in the following USEPA guidance:

- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part A) (Interim Final), USEPA 1989.
- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual Supplemental Guidance – "Standard Default Exposure Factors" (Interim Final), Publication 9285.7-01B, USEPA 1991.
- Guidelines for Data Usability in Risk Assessment (Part A). Office of Solid Waste and Emergency Response (OSWER), Publication OSWER9285.7-09A, USEPA 1992.
- Exposure Factors Handbook, Volumes I, II, and III, USEPA 1997b.
- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments). Office of Emergency and Remedial Response, Washington, DC, USEPA 2002.
- Human Health Toxicity Values in Superfund Risk Assessments. OSWER 9285.7-53. Office of Emergency and Remedial Response, USEPA 2003b.

- Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual (Part E: Supplemental Guidance for Dermal Risk Assessment) Final, USEPA 2004.

These guidance documents comprise the basis of risk assessment methodology in the RCRA/CERCLA programs and are intended to provide a conservative estimate of potential risk within these regulatory programs. The risks determined in the HHRA represent potential risk that may occur to people who contact the areas evaluated and do not represent acute risks from short-term exposures.

The HHRA methodology involves a four-step process: data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization. The following sections present details about HHRA methodology. Data collection and evaluation are presented in Section 6.1. The exposure assessment is presented in Section 6.2, and the toxicity assessment is presented in Section 6.3. The risk characterization is presented in Section 6.4. A discussion of uncertainties is presented in Section 6.5.

6.1 DATA COLLECTION AND EVALUATION

The HHRA evaluates data collected for the offshore areas as discussed in Chapter 3. All data used in the HHRA are validated per protocols identified in USEPA guidance for data usability (USEPA 1992). Inclusion or exclusion of data on the basis of analytical qualifiers is performed in accordance with USEPA guidance (USEPA 1989, 1992). The first step in the HHRA is the evaluation of analytical data on the basis of qualifiers in each medium of concern (surface sediment, surface water, and tissue) using the rationale below.

- Analytical results bearing the R qualifier (indicating that the data point was rejected during the data validation process) are not used in the risk assessments.

- Analytical results bearing the U or UJ qualifier (indicating that the analyte is not detected at the given RL) are retained in the data set and considered non-detects. Where warranted for statistical purposes, each COPC is assigned a numerical value equal to its RL or appropriate detection limit.

- Analytical results for organic chemicals bearing the J qualifier (the reported value is estimated and below the RL), K qualifier (reported value may be biased high), L qualifier (reported value may be biased low), and N qualifier (the spiked recovery is not within control limits) are retained in the data set at the measured concentration.

- Analytical results for inorganic chemicals bearing the B or BJ qualifiers (which indicate that the reported value is less than the contract-required detection limit, but greater than the method detection limit) are retained in the data set at the measured concentration.

- Analytical results for organic compounds bearing the B qualifier (blank-related data) are evaluated as non-detects. The B qualifier denoting blank-related data indicate that the chemical in question was detected not only in the sample but also in quality assurance blanks.

If duplicate samples are collected or duplicate analyses are conducted on a single sample, the following guidelines are employed to select the appropriate sample measurement:

- If both samples/analyses show that the analyte is present, the average of the two detected concentrations is retained for analysis, based on conservative professional judgment;

- If both samples/analyses are not detected, the average of the two RL concentrations is retained for analysis as a non-detect; and

- If only one sample/analysis indicated that the analyte is present, it is retained for analysis and the non-detect value is not included in the risk assessment.

Several classes of organic chemicals assessed in the HHRA share a common mode of exposure and toxicity. For example, there are over 200 PCB congeners that can be identified by analytical chemistry. Many congeners produce the same types of effects and share similar patterns of uptake. The same is true for dioxins. As a result, these classes of organic chemicals are evaluated in accordance with the following methodologies:

- **PCBs** – USEPA policy identifies a standard method for using congener-specific data to estimate the total concentration of PCBs (Van den Berg et al. 1998). Per this method, the concentrations of 18 specific congeners are summed and the sum is doubled to determine a representative total PCB concentration for each sample. The specific PCB congeners used in the evaluation are: PCB 8, PCB 18, PCB 28, PCB 44, PCB 49, PCB 52, PCB 66, PCB 77, PCB 87, PCB 90, PCB 101, PCB 105, PCB 118, PCB 126, PCB 128, PCB 138, PCB 153, PCB 156, PCB 169, PCB 170, PCB 180, PCB 183, PCB 184, PCB 187, PCB 195, PCB 206, and PCB 209. The total PCBs calculated and evaluated in the HHRA use the RLs to represent non-detect compounds.
- **Dioxins and furans** – For dioxins and furans, studies have been performed to develop TEFs that relate the toxicity of common dioxins and furans to the specific toxicity of the dioxin 2,3,7,8-TCDD (Van den Berg et al. 1998, 2006). These TEFs produce a dioxin/furan concentration representative of the cumulative toxicity of the congeners referred to as a TCDD TEQ for each sample. The HHRA evaluates a TCDD TEQ estimated using RLs to represent non-detect compounds.

It is noted that the handling of PAH compounds within the HHRA is treated differently than the ERA. The ERA evaluates the effects of PAH classes (i.e., HMW and LMW), while the HHRA evaluates individual PAH compounds. Therefore, the determination of ecological risks evaluates PAH concentrations that are summed prior to modeling, and the HHRA evaluates each individual PAH compound separately and sums the risks after modeling.

Sample results for arsenic are reported as total arsenic. However, arsenic can be present in both an organic and inorganic form. Inorganic arsenic represents the primary form of arsenic that is a concern for human health. Therefore, an arsenic speciation was performed for the field-collected tissue samples within the Coke Point Offshore and Patapsco River Background Areas to quantify the various forms of arsenic. The results of the arsenic speciation are included on **Table 5.1**. The average percent of inorganic arsenic for crab meat, crab mustard, and fish filet were

averaged together to obtain an overall aquatic organism average percent of inorganic arsenic. The average percent of inorganic arsenic is 10.4 percent for the Coke Point Offshore Area and 12.0 percent for the Patapsco River Area. To maintain consistency within the exposure areas, the average percent of inorganic arsenic for the Coke Point Offshore Area is used in calculating intake of inorganic arsenic in fish tissue and crab meat for the HHRA. For screening, the concentration of arsenic within fish tissue and crab meat is not reduced by the 10.4 percent. This allows for the conservative nature of the screening to remain.

6.1.1 Risk-Based Screening

An initial step of the HHRA is a risk-based screening that is conducted to determine COPCs. The selection of COPCs allows the HHRA to focus on chemicals that may contribute to overall risks (USEPA 1989). Chemicals below risk-based screening criteria are not detected at levels that would affect overall risk and are not considered further in the HHRA. For surface water and sediment, the maximum detected chemical concentration is compared to risk-based screening values. For modeled fish and crab tissue, the 95%UCLM is used in the risk-based screening.

State and Federal risk-based screening criteria are not available for surface water and surface sediment for the complete exposure pathways identified in the CSM (**Figure 2.2)**. As a result, site-specific risk-based criteria are calculated for the exposure to surface water and sediment pathways. The derivation of site-specific risk-based screening criteria follows the methodologies set forth in USEPA guidance (USEPA 2010b). **Appendix D** presents the calculation of site-specific risk-based screening criteria for surface water and surface sediment. The site-specific risk-based screening criteria are based upon a carcinogenic risk level of 10^{-6} or non-carcinogenic hazard quotient (HQ) of 0.1. The risk levels of 10^{-6} and an HQ of 0.1 provide a level of conservancy to account for potential additive effects of multiple chemicals.

The HHRA takes into account crab tissue and fish and crab tissue concentrations modeled from BAFs for surface water and surface sediment. For chemical concentrations modeled from BAFs, aquatic organisms exposed to surface water are represented by fish, and aquatic organisms exposed to sediment are represented by crabs or other bottom dwellers. Fish and crab concentrations for both field-collected organisms and modeled concentrations are compared to USEPA Region 3 risk-based concentrations (RBCs) for fish tissue (USEPA 2009b). For non-carcinogens, the RBC is based on a HQ of 1.0; for the purposes of this screening the RBC is decreased by a factor of 10 to base the screening value on an effective HQ of 0.1. Carcinogenic RBCs are based on a risk level of 10^{-6}. Chemicals considered COPCs in the modeled fish and crabs are also considered COPCs in surface water and sediment, respectively, regardless of screening value comparison to ensure that the total exposure to chemicals in these media is fully evaluated in the HHRA.

6.1.1.1 Analytes Exceeding Risk-Based Screening Levels

The occurrence, distribution, and selection of COPCs based upon the risk-based screening are shown in medium-specific tables following the RAGS D format (USEPA 2002). **Tables 6.2.1** through **6.2.4** present the risk-based screening results for Coke Point Offshore Area media of concern. **Tables 6.2.5** through **6.2.8** 6 present the risk-based screening results for the Patapsco

River Background Area. The tables present the minimum and maximum detected concentrations, the location of the maximum detected concentrations, as well as the frequency of detection (FOD) for each chemical detected. COPCs that exceed risk-based screening criteria are highlighted and presented in bold type. COPCs for all media evaluated in the HHRA are presented in the following sections:

Coke Point Offshore Area

COPCs in Surface Sediment

The following COPCs are identified in surface sediment (**Table 6.2.1**) based on the risk-based screen: arsenic, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, and total PCBs.

COPCs in Surface Water

The following COPCs are identified in surface water (**Table 6.2.2**) based on the risk-based screen: benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, indeno(1,2,3-cd)pyrene, and benzene.

COPCs in Crab Modeled from Sediment

Chemical concentrations in crab tissue are modeled from site-specific sediment BAFs presented in **Appendix H**, except for dioxins, SVOCs and VOCs. The following COPCs are identified in modeled crab tissue (**Table 6.2.3**) based on the risk-based screen: dioxin, arsenic, cobalt, iron, vanadium, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, 1-methylnaphthalene, naphthalene, pyrene, total PCBs, and benzene.

COPCs in Finfish Tissue Modeled from Surface Water

Chemical concentrations in finfish are modeled from literature-based surface water BAFs presented in Section 3.3.4. The following COPCs are identified in modeled finfish tissue (**Table 6.2.4**) based on the risk-based screen: arsenic, manganese, mercury, selenium, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzene.

Patapsco River Background Area

COPCs in Sediment

The following COPCs are identified in background surface sediment (**Table 6.2.5**) based on the risk-based screen: benzo(a)pyrene and total PCBs.

COPCs in Surface Water

The following COPCs are identified in background surface water (**Table 6.2.6**) based on the risk-based screen: benz(a)anthracene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

COPCs in Crab Modeled from Sediment

Chemical concentrations in crab tissue are modeled from site-specific sediment BAFs presented in **Appendix H**, except for dioxins, SVOCs and VOCs. The following COPCs are identified in background modeled crab tissue (**Table 6.2.7**) based on the risk-based screen: dioxin, arsenic, cobalt, iron, vanadium, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and total PCBs.

COPCs in Finfish Tissue Modeled from Surface Water

Chemical concentrations in finfish are modeled from literature-based surface water BAFs presented in Section 3.3.4. The following COPCs are identified in background modeled finfish tissue (**Table 6.2.8**) based on the risk-based screen: arsenic, mercury, selenium, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

6.2 EXPOSURE ASSESSMENT

The exposure assessment determines (qualitatively or quantitatively) the magnitude, frequency, duration, and route of exposure for potential human contact to COPCs in media of concern. The exposure assessment considers only existing conditions at the Coke Point Offshore Areas and does not take into account an future actions within the Coke Point Offshore Area (i.e., dredging, erosion, etc.). Chapter 2, the CSM (**Figure 2.2**), shows the complete exposure pathways identified for the Coke Point Offshore Area. The CSM characterizes the exposure setting with respect to the general physical characteristics of the offshore area and the characteristics of the populations on and near the offshore area based upon existing conditions. The HHRA did not take into account potential future exposures to the offshore area due to erosion, dredging, or other actions. From this exposure characterization, potential receptors are identified. Once the receptors are identified, the pathways by which the previously identified populations may be exposed are determined. These are considered complete pathways of exposure. Each complete exposure pathway identified in the CSM (**Figure 2.2**) is evaluated in the exposure assessment and the HHRA.

The HHRA-SC evaluates a more conservative site use assumption and provides a theoretical maximum exposure that provides a conservative indication of potential contribution from offshore sediment and surface water. The HHRA-SC relies on site-specific bioaccumulation studies rather than field collected fish and crab to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption.

6.2.1 Calculation of Intake

Intake is the numerical representation of estimated exposures. An intake is calculated for each exposure pathway identified in the CSM. Intake is expressed in terms of the quantity of substance in contact with the body per unit body weight per unit time (e.g., milligrams chemical per kilogram body weight per day, also expressed as mg/kg bw-day) (USEPA 1989). Intakes are calculated using variables for chemical concentrations, contact rates, exposure frequency, exposure duration, body weight, and exposure averaging time. The values of some of these variables depend on offshore area conditions and the characteristics of the potential receptors. Exposure estimates are representative of a reasonable maximum exposure which is expected to occur within the Coke Point Offshore Area (USEPA 1989). As a result, some intake variables are not at their individual maximum values, but when combined with other variables, will result in estimates of the reasonable maximum exposure (USEPA 1989).

6.2.2 Exposure Point Concentrations

The first step in quantifying intake (or exposure) is the determination of an EPC for each COPC identified in the risk-based screening. For the HHRA, the EPC represents the concentration of COPCs in media of concern that a selected receptor is expected to contact over a designated exposure period. The EPC is represented by the 95%UCLM (USEPA 1989). The 95%UCLM is used because assuming long-term contact with the maximum concentration is not reasonable (USEPA 1989). EPCs for COPCs identified for the Coke Point Offshore Area are presented in **Tables 6.3.1** through **6.3.4** EPCs for COPCs identified for the Patapsco River Background Area are presented in **Tables 6.3.5** through **6.3.8**.

For surface water and sediment within the Coke Point Offshore Area and the Patapsco River Background Area, the 95%UCLM is determined through the use of the USEPA ProUCL program version 4.00.04 (USEPA 2009c). Where a 95%UCLM could not be calculated or where it exceeds the maximum detected concentration, the maximum concentration is used as the reasonable maximum EPC. Output files of the ProUCL program are included in **Appendix B**. For the Patapsco River Background Area, an additional analysis of the background data is performed in the sensitivity analysis (**Appendix G**) to determine the best representation of background given the limitations of this data set. It is determined that the use of the 95%UCLM, or the maximum detected concentration, is the best representation of EPCs for the Patapsco River Background Area. However, potential human health risks using the median of the data set as the EPC are provided in the Sensitivity Analysis (**Appendix G**) for comparison.

EPCs for modeled fish and crab tissue are discussed below based upon the methodology used. For this exposure scenario, all fish and crab tissue EPCs are determined through the use of biouptake factors. The EPCs of metals, PAHs, and PCBs in crabs are determined through the use of site-specific BAFs Coke Point Offshore Area. The EPCs of dioxins, tributyltins, VOCs, and SVOCs in crab tissue and all chemicals in fish are based upon literature-based BAFs.

EPCs derived using sediment BAFs from Coke Point Laboratory bioaccumulation tests

The Coke Point laboratory bioaccumulation tests evaluated aquatic test species (clams and worms) that are directly representative of the kinds of organisms that wildlife, fish, and crabs would be expected to consume routinely. They indirectly represent bottom-dwelling species that humans are more likely to consume such as crabs, assuming that such organisms spend large amounts of time around Coke Point. Based on this information, laboratory bioaccumulation estimates based on lab bioaccumulation test results are most directly applicable to ecological risk assessment, but also bear relevance to human exposures as a worst case scenario. The concentrations of metals, PAHs, and PCBs detected in clam and worm tissues are used together with the concentrations detected in the exposure sediment to develop site-specific sediment BAFs. Sediment BAFs are multipliers that relate the concentration of chemicals expected in tissue to the concentrations detected in sediment. Statistical derivation of BAFs is presented in **Appendix H**. Sediment BAFs used in the HHRA-SC are presented in **Table 3.8**. BAFs were selected as the highest of the 95% UCLM BAFs from either clams or worms exposed to Coke Point sediments. Sediment BAFs are used to predict crab tissue concentrations using the following equation:

$$\boxed{C_{org\text{-}sed} = C_{sed} * BAF_{org\text{-}sed}}$$

Where:

$C_{org\text{-}sed}$ = EPC of chemical in crab tissue (mg/kg wet weight) taken up from sediment;
C_{sed} = EPC (95%UCLM) of chemical in sediment (mg/kg dry weight);
$BAF_{org\text{-}sed}$ = bioaccumulation factor for chemicals from sediment into aquatic organism (unitless).

EPCs derived using sediment BAFs from literature sources

Laboratory bioaccumulation tests for Coke Point focused on the environmental medium (sediment) and the chemical types (metals, PAHs, and PCBs) considered most likely to drive source-related risks. Therefore, they did not include testing and analysis of other chemicals in tissue. Instead, BAFs for these chemicals and media were derived from the scientific literature. Sediment BAFs are derived from the scientific literature for dioxins, VOCs, and organotins. Sediment BAFs for dioxins, VOCs, and organotins are presented in **Table 3.8**. USACE maintains a database of chemical-specific biota-sediment BSAFs from studies of a wide range of organisms and sediment types (USACE 2009). Laboratory bioaccumulation tests following protocols similar to those used in this study are one of the primary sources of BSAFs in the database. A BSAF is different from a sediment BAF because it considers the influence of organic carbon in sediment and lipids in tissue on uptake relationships (USACE 2009). For each chemical, EA compiled the mean BSAFs reported for fish and marine and estuarine invertebrates.

For each chemical, the average of the BSAFs is calculated, and the values are converted to sediment BAFs using the following equation:

$$BAF_{org\text{-}sed} = \frac{C_{lipid}}{C_{TOC}} \times BSAF$$

Where:

C_{lipid} = Concentration of lipid in tissue (mg/kg dry weight);
C_{TOC} = Concentration of total organic carbon in sediment (mg/kg dry weight);
BSAF = Biota sediment accumulation factor (unitless);
$BAF_{org\text{-}sed}$ = Bioaccumulation factor for chemicals from sediment into biota (unitless)

The conversion assumes an average total organic carbon content in Coke Point sediments of 6.8 percent based on sample results from Coke Point Offshore Area surface sediment samples. When sediment BAFs were not available from this source, a default value of 1 was assigned. This assumes that the concentration in the organism is the same as the concentration in the sediment. This default is used as a standard practice in risk assessment. There are adequate data available from the BSAF database (USACE 2009) for estuarine organisms to develop a BSAF for TCDD that would be relevant to estuarine exposures. However, the database did not contain adequate studies of other dioxin/furan congeners in estuarine organisms to develop BSAFs for the full list of detected congeners. The USACE BSAF database (USACE 2009) does include BSAF data for both TCDD other dioxin and furan congeners from a study of trout, which is a freshwater fish (Burkhard et al. 2004). These freshwater BSAFs are used together with the estuarine TCDD BSAF to extrapolate estuarine BSAFs for each congener based on relative bioaccumulation compared to TCDD. These BSAFs are presented in **Table 3.8**. Following the conversion to a BAF, the EPC of chemicals in crab tissue are determined in the same manner as concentrations from site-specific BAFs.

EPCs derived using surface water BAFs from literature sources

As discussed above, laboratory bioaccumulation tests for Coke Point focused on the environmental medium (sediment) considered most likely to drive source-related risks. Therefore, they did not include testing and analysis of uptake from surface water. Instead, BAFs for chemicals in surface water are derived from information reported in the scientific literature. Literature-based water-to-fish uptake factors or bioaccumulation equations are used to estimate concentrations of COPCs in fish tissue using the following equation:

$$\boxed{C_{fish} = C_{water} * BAF_{fish\text{-}water}}$$

Where:

C_{fish} = Concentration of chemical in fish (mg/kg wet weight);
C_{water} = 95%UCLM of COPC in water (mg/L);
$BAF_{fish\text{-}water}$ = Uptake factor for chemicals in fish (unitless).

Bioaccumulation factors and their sources are summarized in **Table 3.9**. Uptake factors for several organics are derived using regressions from the BCF Win Program developed by the USEPA's Office of Pollution Prevention and Toxics and Syracuse Research Corporation. When these uptake factors are not available for a chemical, literature-based factors are used from sources such as the Risk Assessment Information System (Oak Ridge National Laboratory 2009) and USEPA's Ambient Aquatic Life Water Quality Criteria documents (USEPA 1980, 1985a-c, 1986, 1987a,b).

In the absence of a literature-based bioaccumulation model or uptake factor for a COPC, an accumulation factor of 1 is used to estimate chemical concentrations in fish. Use of this default accumulation factor assumes that the concentration in the organism is the same as the concentration in the surface water, and is expected to provide a conservative estimate of accumulation for most chemicals, and is expected to over-estimate accumulation for non-bioaccumulative compounds. This default is used as a standard practice in risk assessment.

6.2.3 Exposure Parameters

The second step in quantifying intake requires the identification of exposure parameters. Exposure parameters include rates of contact (e.g., skin surface areas), exposure frequency and duration, body weight, and averaging time. The following sections and **Tables 6.4.1** through **6.4.12** detail the exposure parameters for each potential receptor. Specific exposure parameters for each receptor are chosen based on USEPA guidance (USEPA 1989, 1991, 2004, 2008a), state advisories and other appropriate resources.

The contact rate reflects the amount of contaminated media contacted per unit time or event. For dermal contact with chemicals in surface water or sediment, the contact rate is estimated by combining information on exposed skin surface area, dermal permeability of a chemical, and exposure time. Exposure frequency and duration are used to estimate the total time of exposure to COPCs in media of concern. The body weight represents the average body weight over an exposure period (USEPA 1989). For adults (adult recreational users and watermen), USEPA recommended body weight is 70 kilograms (kg); for children (recreational users aged 3 to 6 years), it is 18 kg (USEPA 2008a). The adolescent is assumed to be 45 kg.

Surface Water

As discussed in the CSM (Chapter 2), exposure to surface water for the recreational user assumes a swimming scenario. During swimming, a recreational user will have dermal (skin) contact with surface water and ingest very small amounts of surface water. Any ingestion is expected to be incidental due to the brackish nature of the water. Incidental ingestion is assumed at $1/100^{th}$ of the USEPA default drinking water rates (ATSDR 2003). The incidental ingestion rate is therefore 0.02 liter/day for the adult and 0.01 liter/day for both the adolescent and the child recreational users (ASTDR 2003). The recommended surface area (SA) for adult is 18,000 square centimeters (cm^2) and the child is 6,600 cm^2, based on the mean surface area for the total body (USEPA 2004). For the adolescent, the mean total body area is 15,900 cm^2 for 12 to16

years of age and 10,800 cm^2 for 6 to 11 years. An average of the two age ranges yields a body SA of 13,350 cm^2 for the adolescent aged 6 to 16 years (USEPA 1997b).

The offshore area near the Coke Point Peninsula is not expected to be a high use area for swimming or other water activities. Additionally, other public access areas are located near but not immediately adjacent to the Coke Point Peninsula that present a more attractive area for swimming and other water activities (i.e., state parks, private docks, etc.). However, access is not controlled to the waters around the Coke Point Peninsula; therefore, swimming is a possibility for this area. To aid in potential identification of theoretical maximum exposures, the offshore area around Coke Point is assessed for a maximum potential use. It is assumed that recreational users may swim in the Coke Point Offshore Area for 32 days per year, that is 2 days per week when water temperatures are reasonable for swimming or other water activities, namely from June to September (4 months or 16 weeks). It is also estimated that recreational users swim for two hours a day, regardless of the exposure scenario. The swim time takes into account that boaters are primarily on the water from noon to 5:00 p.m. with 2 hours of that time spent swimming or in the water.

For the watermen, exposure to surface water is likely limited to the hands and arms (forearms and upper arms). The mean arm SA (2,910 cm^2) combined with the mean hand SA (990 cm^2) results in an SA of 3,900 cm^2 for watermen (USEPA 1997b). It is expected that watermen would not fish exclusively within the Coke Point Offshore Area, but instead would fish near Coke Point 1 day per week for 39 weeks (March through November). The water contact with surface water is based upon a typical work day. Although watermen may work longer hours, actual contact with surface water is assumed at 8 hours. Contact with surface water accounts for all surface water dermal exposure and not just immersion in the water. This includes pulling in nets or crab pots, handling the catch, etc. In addition, the watermen are not assumed to wear gloves or other protective equipment.

Sediment

Due to the depth of surface water, recreational users are expected to contact sediment primarily with the feet and maybe lower legs. For the adult, the sum of the mean lower legs SA (2,560 cm^2) and mean feet (1,310 cm^2) is 3,870 cm^2 (USEPA 1997b). For the adolescent, lower leg estimates are not available in USEPA guidance (USEPA 2004, 1997b). Therefore, the SA identified for the adult is used for the adolescent as a conservative measure. For the child, the mean leg (2,070 cm^2) and mean feet (550 cm^2) sum is 2,620 cm^2 for the 3 to 6 year age range (USEPA 2008a). For skin exposure to sediment, an adherence factor (AF) is determined that represents the ability of sediment to adhere to the skin surface (USEPA 2004). AFs for sediments are likely to be less than for soils because contact with water may wash the sediment off the skin (USEPA 2004). However, AFs for soil are used to represent the sediment AFs as a conservative measure. For the adult recreational user, the recommended weighted AF for an adult resident is used [0.07 milligrams per square centimeter (mg/cm^2)] as a conservative measure. The recommended weighted AF for a child recreational user is 0.2 mg/cm^2 for children playing in wet soil (USEPA 2004). The adolescent is conservatively estimated with the same AF as the child.

Watermen contact with sediment is limited to the hands and forearms as contact to sediment is expected to occur while hauling fishing nets into boats. The mean arm SA (2,910 cm^2) and mean hand SA (990 cm^2) sum is 3,900 cm^2. The recommended AF for a commercial or industrial worker contact with soil is 0.2 mg/cm^2, based upon actual body parts exposed (face, forearms and hands) and high-end contact activity (USEPA 2004). This worker AF is conservatively assumed for watermen.

The exposure frequency for contact with sediment is assumed at the same number of days per year as surface water.

Fish and Crab Ingestion

Ingestion rates for the recreational user are taken from both the UESPA guidance (1997b) and the MDE 2007 Fish Advisory Table. USEPA identifies an amount of fish eaten per day from Freshwater/Estuarine areas. However, the USEPA estimate is based upon a total wet weight of fish eaten per year averaged over a number of days, not for each meal. The weights do not account for cooking. The weights for an adult, adolescent, and child are 9.8, 8.7, and 4.6 ounces per day, respectively (USEPA 1997b). MDE estimated the amount of fish eaten per meal for varying receptors to determine appropriate fish advisories for the Patapsco River (MDE 2007). MDE estimated a cooked weight of fish eaten for an adult male, adult female, and child at 8, 6, and 3 ounces, respectively (MDE 2007). The cooked weights used by MDE correspond to the wet weights presented in the USEPA guidance (USEPA 1997b). The number of meals per year is estimated based upon recreational users fishing or crabbing in the area 2 days per week when water temperatures are reasonable for swimming or other water activities, namely from June to September (4 months or 16 weeks). The exposure frequency of 32 meals per year of fish and crabs is evenly divided between fish and crab consumption. As a result, the recreational user is assumed to eat 16 meals per year of fish and 16 meals per year of crabs.

The intake rate identified for the adult recreational user is also used for the watermen, since the watermen are not expected to fish exclusively within the Coke Point Offshore Area. The exposure frequency identified for the surface water and sediment pathways is used as the number of meals per year (39 meals per year) of fish and crabs. The watermen is assumed to eat 19.5 meals per year of fish and 19.5 meals per year of crabs.

6.2.4 Exposure Intake Equations

To quantify intake, the EPCs and exposure parameters are combined to estimate daily intakes over an exposure period. The COPCs identified in surface water, sediment, and fish tissue are converted into systemic doses, taking into account rates of contact (e.g., dermal exposure areas) and absorption rate of each COPC. The magnitude (i.e., EPCs), frequency (i.e., number of days per year), and duration of these exposures are then combined to obtain estimates of daily intakes over a specified period of time (i.e., lifetime, activity-specific duration). Dermal exposure to surface water is calculated by converting the EPC into an Absorbed Dose per event (DA_{event}). This conversion takes into account the permeability of compounds across multiple layers of skin with respect to the length of the event and the fraction of each compound absorbed once dissolved into the skin.

Two different measures of intake are analyzed, depending on the nature of the effect being evaluated. When evaluating longer-term (i.e., chronic) exposures to chemicals that produce adverse non-carcinogenic effects, intakes are averaged over the period of exposure (i.e., the averaging time [AT]) (USEPA 1989). This measure of intake is referred to as the average daily intake (ADI) and is a less than lifetime exposure. For chemicals that produce carcinogenic effects, intakes are averaged over an entire lifetime and are referred to as the lifetime average daily intake (LADI) (USEPA 1989). The generic equation to calculate intakes is given below:

$$(L)ADI = \frac{EPC \ x \ IF \ x \ EF \ x \ ED \ x \ RAF}{BW \ x \ AT} \ \text{x CF}$$

Where:

(L)ADI	=	(Lifetime) Average daily intake (mg/kg bw-day)
EPC	=	COPC concentration in a specific medium (mg/kg or mg/L)
IF	=	Intake factor[3] (mg/day, liters per day [L/day], or kg/meal)
EF	=	Exposure frequency (days/year or meals/year)
ED	=	Exposure duration (years)
RAF	=	Relative absorption factor (unitless) (Dermal exposures only)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (10^{-6} kilograms per milligram (kg/mg) or 10^{-3} L/cm^3) (Dermal exposures only)

6.3 TOXICITY ASSESSMENT

Toxicity assessment is the third step of the HHRA process. The toxicity assessment considers the types of potential adverse health effects associated with exposure to COPCs; the relationship between magnitude of exposure and potential adverse effects; and related uncertainties, such as the weight of evidence of a particular COPC's carcinogenicity in humans.

USEPA guidance (USEPA 1989) specifies that the assessment be accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether studies claim that exposure to a COPC may cause the incidence of an adverse effect. USEPA specifies the dose-response assessment which is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, specific toxicity values are derived by USEPA that can be used to estimate the incidence of potentially adverse effects occurring in humans at different exposure levels (USEPA 1989). Individual toxicological profiles, which present a summary of available toxicological information used in the

[3] The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

determination of toxicity values for COPCs, are provided in **Appendix E**. The HHRA utilizes existing toxicity information developed in accordance with USEPA guidance (USEPA 1989 and 2003b). The USEPA has identified a three-tiered approach for selection of toxicity values (USEPA 2003c). Tier 1 values are available from IRIS (USEPA 2010c). IRIS presents USEPA established, current toxicity values. These toxicity values have undergone peer reviews and USEPA consensus reviews and represent the USEPA scientific position regarding the toxicity of the chemicals based on the data available at the time of the review. When toxicity values are not available from IRIS, Tier 2 values are then examined.

Tier 2 values are USEPA's Provisional Peer Reviewed Toxicity Values, which are developed by the Office of Research and Development, the National Center for Environmental Assessment, and the Superfund Health Risk Technical Support Center on a chemical-specific basis when requested by the Superfund program. These values have not undergone the rigorous review process as the IRIS toxicity values.

Tier 3, other toxicity values, are considered when Tier 1 or Tier 2 toxicity values are not available. These toxicity values are taken from additional USEPA and non-USEPA sources and are chosen based on the most current and best peer-reviewed source available. Priority is given to sources of information that are the most current, and the basis of the toxicity value is transparent and publicly available. The CalEPA Office of Environmental Health Hazard Assessment Toxicity Criteria Database (CalEPA 2010), the ATSDR Minimal Risk Levels, and the Health Effects Assessment Summary Tables (USEPA 1997c) are the Tier 3 sources utilized for this HHRA.

For this HHRA, two toxicological endpoints are considered: carcinogenic and non-carcinogenic. USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for COPCs are summarized in **Table 6.5.1**. USEPA-derived toxicity values for evaluating potential carcinogenic effects for COPCs are summarized in **Table 6.6**. The following sections detail how each endpoint is determined.

6.3.1 Toxicity Assessment for Non-Carcinogens

Non-carcinogenic endpoints are evaluated through the use of a reference dose, or RfD. For this HHRA only chronic effects are evaluated. A chronic RfD is defined as an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for humans, including sensitive subpopulations, that is likely to be without adverse effects during a lifetime (USEPA 1989). Chronic RfDs are specifically developed to be protective for long-term exposure to a COPC.

The first step in determining RfDs is the determination of the critical study and toxic effect of a chemical. From this study, an experimental exposure level is calculated that represents the highest level tested at which no adverse effects (including the critical toxic effect) are demonstrated. Non-carcinogens are typically judged to have a threshold daily dose below which adverse effects are unlikely to occur. This concentration is called the NOAEL, and is usually derived from either animal laboratory experiments or human epidemiology investigations (usually workplace studies). In developing a toxicity value or human NOAEL for non-

carcinogens (i.e., an RfD), the regulatory approach is to: (1) identify the critical toxic effect associated with chemical exposure (i.e., the most sensitive adverse effect); (2) identify the threshold dose in either an animal or human study; and (3) modify this dose to account for interspecies variability (where appropriate), differences in individual sensitivity (within-species variability), and other uncertainty and modifying factors. Specific detail concerning the methodology used by USEPA for deriving non-carcinogenic reference values is discussed further in USEPA guidance (USEPA 2010c). In some toxicological studies, a LOAEL, rather than a NOAEL, is available. The LOAEL represents the lowest exposure level where biologically significant increases in frequency or severity of adverse effects between the exposed population and a control group occur. An RfD can be determined through the use of the LOAEL after adjustment for species differences are applied.

When deriving an RfD from experimental data, uncertainty and modifying factors are usually applied to the LOAEL or NOAEL. The HHRA utilizes existing RfDs from sources identified in the tiered approach presented in Section 5.3. RfDs used in this HHRA already have the appropriate uncertainty and modifying factors applied by the source identified in **Table 6.5.1**. Uncertainty factors are intended to account for specific types of uncertainty inherent in extrapolation from the available data. The modifying factor accounts for the confidence in the scientific studies from which toxicity values are derived, according to such parameters as study quality and study reproducibility. The uncertainty factors are generally 10-fold, default factors used in operationally deriving the RfD from experimental data. Uncertainty factors less than 10 can be used. An uncertainty factor of 3 can be used in place of one-half power ($10^{0.5}$) when appropriate. The uncertainty factors are intended to account for: (1) variation in susceptibility among the members of the human population (i.e., inter-individual or intraspecies variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies uncertainty); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure (i.e., extrapolating from subchronic to chronic exposure); (4) uncertainty in extrapolating from a LOAEL rather than from a NOAEL; and (5) uncertainty associated with extrapolation when the database is incomplete. The maximum uncertainty factor for the derivation of the RfD is 3,000.

A modifying factor ranging from 1 to 10 is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire database not addressed by the uncertainty factors. The default value for the modifying factor is 1. USEPA discontinued the use of the modifying factor in 2004. However, toxicity values for some contaminants, derived before 2004, still contain a modifying factor. To calculate the RfD, the appropriate NOAEL is divided by the product of all the applicable uncertainty factors and the modifying factor. This is expressed as:

$$RfD = NOAEL / (Uncertainty\ Factor_1 \times Uncertainty\ Factor_2 \ldots \times Modifying\ Factor)$$

Where:

RfD	=	Reference dose (mg/kg bw-day)
NOAEL	=	No observed adverse effect level (mg/kg bw-day)

The resulting RfD is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg bw-day).

6.3.2 Toxicity Assessment for Carcinogens

Unlike non-carcinogens, carcinogens are generally assumed to have no threshold. There is presumed to be no level of exposure below which carcinogenic effects will not manifest themselves. This "non-threshold" concept is based on the premise that there are small, finite probabilities of inducing a carcinogenic response associated with every level of exposure to a potential carcinogen. USEPA uses a two-part evaluation for carcinogenic effects. This evaluation includes the assignment of a weight-of-evidence classification and the quantification of a cancer toxic potency concentration. Quantification is expressed as a slope factor (SF) for oral and dermal exposures, which reflects the dose-response data for the carcinogenic endpoint(s) (USEPA 1989 and 2010c).

The SF converts estimated daily intakes averaged over a lifetime of exposure directly to incremental risk of an individual developing cancer. The SF is the upper 95th percentile confidence limit of the probability of response per unit daily intake of a chemical over a lifetime. The SF is expressed in units of proportion (of a population) affected per mg/kg bw-day. Typically, the SF is used to estimate the upper-bound lifetime probability of a person developing cancer from exposure to a given concentration of a carcinogen. SFs are generally based on experimental animal data, unless suitable epidemiological studies are available. Because of the difficulty in detecting and measuring carcinogenic endpoints at low exposure concentrations, SFs are typically developed by using a model to fit the available high-dose, experimental animal data, and then extrapolating downward to the low-dose range to which humans are typically exposed. USEPA recommends the linear multistage model to derive an SF. The model is conservative and provides an upper bound estimate of excess lifetime cancer risk. These methods and approaches are discussed in greater detail within the USEPA *Cancer Guidelines* (USEPA 2005b).

The weight-of-evidence classification system assigns a letter or alphanumeric (A through E) to each potential carcinogen that reflects an assessment of its potential to be a human carcinogen (USEPA 1989).[4] USEPA has recently established five recommended standard hazard descriptors: "*Carcinogenic to Humans*," "*Likely to Be Carcinogenic to Humans*," "*Suggestive Evidence of Carcinogenic Potential*," "*Inadequate Information to Assess Carcinogenic Potential*," and "*Not Likely to Be Carcinogenic to Humans*" (USEPA 2005b). The weight-of-evidence classification is based on a thorough scientific examination of the body of available data. Only compounds that have a weight-of-evidence classification of C or above are considered to have carcinogenic potential in this HHRA.

[4] A = a known human carcinogen; B1 = a probable human carcinogen, based on sufficient animal data and limited human data; B2 = a probable human carcinogen based on sufficient animal data and inadequate or no human data; C = a possible human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of non-carcinogenicity for humans.

COPCs that are determined to have sufficient weight of evidence for carcinogenic endpoints are also assessed for mutagenic modes of action. The mutagenic mode of action is assessed with a linear approach (USEPA 2005b). **Table 6.6** identifies the COPCs with a mutagenic mode of action. COPCs identified as mutagenic have sensitivity pertaining to cancer risks associated with early-life exposures. To account for the early-life exposure and the mutagenic mode of action, the cancer potency estimates are adjusted. USEPA recommends, for mutagenic chemicals, when no chemical-specific data exist, a default approach using estimates from chronic studies (i.e., cancer slope factors) with appropriate modifications to address the potential for differential risk of early-life stage exposure (USEPA 2005b,c). A modification for early-life stage exposure to mutagenic COPCs is required because available studies indicate higher cancer risks resulting from a given exposure occurring early in life when compared with the same amount of exposure during adulthood (USEPA 2005b). For this HHRA, the SFs for COPCs identified with a mutagenic mode of action are modified for the following (USEPA 2005c):

- For exposures between 3 and 16 years of age, a 3-fold adjustment is made.
- For exposures after turning 16 years of age, no adjustment is made.

6.3.3 Modifications for Dermal Contact

Toxicity values specific to dermal exposures are not available and require adjustment of the oral toxicity values (oral RfDs or SFs). This adjustment accounts for the difference between the daily intake doses through dermal contact as opposed to ingestion. Most toxicity values are based on the actual administered dose and must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to use in dermal contact risk assessment (USEPA 1989 and 2004). USEPA recommends utilizing oral absorption efficiency factors in converting oral toxicity values to dermal toxicity values (USEPA 2004). This adjustment accounts for the absorption efficiency in the "critical study," which is utilized in determining the RfD and SF. Where oral absorption in the critical study is essentially complete (i.e., 100 percent), the absorbed dose is equivalent to the administered dose, and no adjustment of oral toxicity values is necessary when evaluating dermal exposures. When gastrointestinal absorption of a chemical in the critical study is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose, and toxicity values for dermal exposure are adjusted to account for the difference in the absorbed dose relative to the administered dose. To account for the differences between the administered (oral) and the absorbed (dermal) dose, RfDs and SFs are modified by the GIABS.

In addition to the GIABS modification of the toxicity values for dermal contact, dermal contact rates are also evaluated based upon a chemical's ability to be absorbed through the skin surface. This absorption rate is dependent upon the medium evaluated. For sediments, USEPA has identified an ABS that is chemical-specific. The ABS value reflects the desorption of a chemical from sediment and the absorption of the chemical across the skin and into the blood stream. The USEPA-recommended ABS values are based upon available experimental data for dermal absorption from contaminated soil (USEPA 2004 and 2003c). Recommended values are presented that account for uncertainty which may arise from different soil types, loading rates, chemical concentrations, and other conditions.

For surface water, dermal exposures are adjusted by two methods. For organics the dermal exposures are adjusted by the FA, PC, and the exposure time. The FA accounts for chemical loss due to shedding during absorption from the skin to the bloodstream, the PC represents the ability of a chemical to cross the stratum corneum, and exposure time is used to determine the diffusion of the compound across the skin to accurately determine the dose dissolved into the bloodstream. Inorganic Compounds are adjusted by the PC only.

The chemical-specific parameters utilized in assessing dermal exposure, GIABS, ABS, FA, and PC are selected from the USEPA dermal guidance (USEPA 2003c, 2004). Additional chemical-specific parameters not provided in the latest USEPA guidance are taken from the Toxicity and Chemical-Specific Factors Database (USDOE 2010). **Table 6.5.2** presents relative chemical-specific parameters utilized in calculating dermal exposure for COPCs.

6.4 RISK CHARACTERIZATION

In the risk characterization, the chemical intakes (Section 6.2) and toxicity values (Section 6.3) are summarized and integrated into quantitative expressions of risk. The risk characterization results in a numerical expression of risk for human contact with COPCs in media of concern. Non-carcinogenic and carcinogenic effects are calculated for recreational users and commercial watermen. To characterize potential non-carcinogenic effects, comparisons are made between chemical intakes and toxicity values. For potential carcinogenic effects, incremental probabilities that a receptor will develop cancer over a lifetime of exposure are estimated from chemical intakes and chemical-specific dose-response information. The risk characterization is performed following USEPA guidance (USEPA 1989). The following text details the risk characterization methodology. There are separate discussions for carcinogenic and non-carcinogenic effects because the methodology differs for these two modes of chemical toxicity.

6.4.1 Hazard Index for Non-Carcinogenic Effects

The potential human health risks associated with exposures to non-carcinogenic COPCs are estimated by comparing the ADI with the chemical-specific RfD, as per USEPA Guidance (USEPA 1989). A HQ is derived for each COPC, as shown in the equation below:

$$HQ = \frac{ADI}{RfD}$$

Where:

HQ	=	Hazard Quotient; ratio of average daily intake level to acceptable daily intake level (unitless)
ADI	=	Estimated non-carcinogenic average daily intake (mg/kg bw-day)
RfD	=	Reference dose (mg/kg bw-day)

If the average daily dose exceeds the RfD, the HQ exceeds a ratio of one (1) and there may be concern that potential adverse systemic health effects would be observed in the exposed populations. Per input from USEPA, ratios below 1.5 are considered acceptable because these

round to 1 (USEPA 2011b). If the ADI does not exceed the RfD, the HQ does not exceed 1 and there is no concern that potential adverse systemic health effects would be observed in the exposed populations. However, if the sum of several HQs exceeds 1, and the COPCs affect the same target organ, there may be concern that potential adverse systemic health effects would be observed in the exposed populations. In general, the higher the HQ is above 1, the greater the level of concern. However, the HQ does not represent a statistical probability that an adverse health effect would occur.

For consideration of exposures to more than one chemical causing systemic toxicity via several different pathways, the individual HQs are summed to provide an overall hazard index (HI). If the HI is less than 1, then no adverse health effects are likely to be associated with exposures at the offshore area. Per input from USEPA, HIs below a target level of 1.5 are considered acceptable because these would round to 1 (USEPA 2011b). However, if the total HI is greater than the target level, separate endpoint-specific HIs may be calculated based on toxic endpoint of concern or target organ (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if an endpoint-specific HI is greater than the target level is there reason for concern about potential health effects for that endpoint.

6.4.2 Carcinogenic Risks

Carcinogenic risk is estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The numerical estimate of excess lifetime cancer risk is calculated by multiplying the LADI by the risk per unit dose (SF).

This is shown in the following equation:

$$Risk = LADI \times SF$$

Where:

Risk	=	Unitless probability of an exposed individual developing cancer
LADI	=	Lifetime incremental cancer average daily intake (mg/kg bw-day)
SF	=	Cancer slope factor $(\text{mg/kg bw-day})^{-1}$

Because the SF is the statistical 95th percent upper-bound confidence limit on the dose-response slope, this method provides a conservative, upper-bound estimate of risk.

It should be noted that the interpretation of the significance of the carcinogenic risk estimate is based on the appropriate public policy. USEPA in the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300) (USEPA 1990) states that:

> *"...For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}."*

6.5 RISK CHARACTERIZATION RESULTS FOR SOURCE CHARACTERIZATION AND SITE PLANNING

Risk characterization calculations are presented in **Tables 6.7.1** through **6.7.4** for the Coke Point Offshore Area and **Tables 6.7.5** through **6.7.8** for the Patapsco River Background Area. **Tables 6.7.9** through **6.7.12** present calculation of the dermal absorbed dose from surface water. To assess the potential health effects of more than one chemical (both carcinogens and non-carcinogens), risk characterization results are summed across each medium of concern. The summation assumes dose additivity in the absence of information on specific mixtures of chemicals (USEPA 1989). In addition, risk characterization results are summed across all pathways to determine a cumulative result for total exposure to the Coke Point Offshore Area and the Patapsco River Background Area.

An adjustment is made to the arsenic EPC in **Tables 6.7.1** and **6.7.8** in fish and crabs to account for the actual percentage of inorganic arsenic in fish tissue and crab meat (**Table 5.1**). Arsenic speciation was performed for field-collected fish (white perch) and crab tissue and mustard. As discussed in Section 5.1, an average percentage of inorganic arsenic for both the Coke Point Offshore Area and the Patapsco River Background Area is established at 10.4 percent (**Table 5.1**).

Tables 6.9.1 through **6.9.8** present the estimates of cumulative excess risks across all pathways for non-carcinogenic and carcinogenic effects for all receptors. A risk summary for COPCs that contribute significantly to risks is presented in **Tables 6.10.1** through **6.10.8**. COPCs are only identified on **Tables 6.10.1** through **6.10.8** if cumulative carcinogenic risks are greater than the target risk range of 10^{-6} to 10^{-4} or cumulative non-carcinogenic risks are greater than 1.0. These tables present only the COPCs that contribute carcinogenic risks greater than 10^{-6} or non-carcinogenic risks greater than 0.1.

6.5.1 Adult Recreational User Results

The adult recreational user is evaluated for dermal exposure to surface water and surface sediment, incidental ingestion of surface water, and ingestion of modeled fish and crabs. Risk calculations are presented in **Table 6.7.1**. A risk summary for this receptor is provided in **Table 6.9.1**, and a presentation of contributors to risk (carcinogenic risk greater than $1x10^{-6}$ or a HQ greater than 0.1) is provided in **Table 6.10.1**.

6.5.1.1 Coke Point Offshore Area Adult Recreational User Results

Non-Carcinogenic Results

The total calculated non-carcinogenic HI for the adult recreational user is 2.0. The ingestion of crab pathway is the primary contributor to the non-carcinogenic HI. The estimated HI for surface water exposure is 0.006. The estimated HI for ingestion of fish as modeled for the Coke Point Offshore Area is 0.3. The estimated HI for surface sediment exposure is 0.01. The estimated HI for ingestion of crabs as modeled for the Coke Point Offshore Area is 1.7. A breakdown by target organ is provided on **Table 6.10.1**. The developmental system has an HI

slightly greater than 1, which is a result of dioxin and napthalene. No COPC has an HQ greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adult recreational user is 2.6 x 10^{-3}. The estimated risk for surface water exposure is 9.2 x 10^{-4}. The estimated risk for ingestion of fish as modeled for the Coke Point Offshore Area is 6.1 x 10^{-4}. The estimated risk for surface sediment exposure is 2.7 x 10^{-6}. The estimated risk for ingestion of crab as modeled for the Coke Point Offshore Area is 1.0 x 10^{-3}. PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water, modeled crab tissue, and modeled fish tissue and total PCBs in modeled crab tissue, have excess cancer risk above 10^{-4}.

6.5.1.2 Patapsco River Background Adult Recreational User Results

Patapsco River background risk calculations are presented in **Table 6.7.5** for the adult recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 6.9.5**, and a presentation of contributors to risk (carcinogenic risk greater than 1x10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.5**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adult recreational user is 0.9. The estimated HI for surface water exposure is 0.003. The estimated HI for ingestion of fish as modeled for the Patapsco River Background Area is 0.3. The estimated HI for surface sediment exposure is 0.003. The estimated HI for ingestion of crab as modeled for the Patapsco River Background Area is 0.6.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adult recreational user is 2.3 x 10^{-4}. The estimated risk for surface water exposure is 5.8 x 10^{-5}. The estimated risk for ingestion of fish as modeled for the Patapsco River Background Area is 4.0 x 10^{-5}. The estimated risk for surface sediment exposure is 3.0 x 10^{-7}. The estimated risk for ingestion of crab as modeled for the Patapsco River Background Area is 1.3 x 10^{-4}. No COPCs have risk above 10^{-4}, total PCBs in modeled crabs and PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water and modeled fish and crabs are the primary contributors of excess cancer risks.

6.5.2 Adolescent Recreational User Results

The adolescent recreational user is evaluated for dermal exposure to surface water and surface sediment, ingestion of surface water, and ingestion of fish and crab. Risk calculations are presented in **Table 6.7.2**. A risk summary for this receptor is provided in **Table 6.9.2**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.2**.

6.5.2.1 Coke Point Offshore Area Adolescent Recreational User Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent recreational user is 2.4. The ingestion of crab pathway is the primary contributor to the non-carcinogenic HI. The estimated HI for surface water exposure is 0.006. The estimated HI for ingestion of fish as modeled for the Coke Point Offshore Area is 0.4. The estimated HI for surface sediment exposure is 0.04. The estimated HI for ingestion of crab as modeled for the Coke Point Offshore Area is 1.9. A breakdown by target organ is provided on **Table 6.10.2**. The developmental system has an HI slightly greater than 1, which is attributable to dioxin and naphthalene. No COPC has an HQ greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adolescent recreational user is 2.7×10^{-3}. The estimated risk for surface water exposure is 1.1×10^{-3}. The estimated risk for ingestion of fish as modeled for the Coke Point Offshore Area is 7.0×10^{-4}. The estimated risk for surface sediment exposure is 1.2×10^{-5}. The estimated risk for ingestion of crab as modeled for the Coke Point Offshore Area is 9.7×10^{-4}. Exposure to PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water, modeled fish, and modeled crab tissue represents excess cancer risk above 10^{-4}.

6.5.2.2 Patapsco River Background Adolescent Recreational User Results

Patapsco River background risk calculations are presented in **Table 6.7.6** for the adolescent recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 6.9.6**, and a presentation of contributors to risk (carcinogenic risk greater than 1×10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.6**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the adolescent recreational user is 1. The estimated HI for surface water exposure is 0.004. The estimated HI for ingestion of fish as modeled for the Patapsco River Background Area is 0.3. The estimated HI for surface sediment exposure is 0.02. The estimated HI for ingestion of crab as modeled for the Patapsco River Background Area is 0.7.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the adolescent recreational user is 2.1×10^{-4}. The estimated risk for surface water exposure is 6.7×10^{-5}. The estimated risk for ingestion of fish as modeled for the Patapsco River Background Area is 4.5×10^{-5}. The estimated risk for surface sediment exposure is 1.1×10^{-6}. The estimated risk for ingestion of crab as modeled for the Patapsco River Background Area is 9.7×10^{-5}. No COPCs have risk above 10^{-4}, total PCBs in modeled crabs and PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water, modeled fish, and modeled crab are the primary contributors of excess cancer risks.

6.5.3 Child Recreational User Results

The child recreational user is evaluated for dermal exposure to surface water and surface sediment, ingestion of surface water, and ingestion of fish and crab. Risk calculations are presented in **Table 6.7.3**. A risk summary for this receptor is provided in **Table 6.9.3**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.3**.

6.5.3.1 Coke Point Offshore Area Child Recreational User Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the child recreational user is 3.0. The ingestion of crab pathway is the primary contributor to non-carcinogenic HI. The estimated HI for surface water exposure is 0.008. The estimated HI for ingestion of fish as modeled for the Coke Point Offshore Area is 0.5. The estimated HI for surface sediment exposure is 0.07. The estimated HI for ingestion of crab as modeled for the Coke Point Offshore Area is 2.4. A breakdown by target organ is provided on **Table 6.10.3**. The developmental system and dioxin have an HI slightly greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the child recreational user is 1.0 x 10^{-3}. The estimated risk for surface water exposure is 3.9 x 10^{-4}. The estimated risk for ingestion of fish as modeled for the Coke Point Offshore Area is 2.6 x 10^{-4}. The estimated risk for surface sediment exposure is 5.9 x 10^{-6}. The estimated risk for ingestion of crab as modeled for the Coke Point Offshore Area is 3.6 x 10^{-4}. PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water, modeled fish, and modeled crabs have excess cancer risk above 10^{-4}.

6.5.3.2 Patapsco River Background Child Recreational User Results

Patapsco River background risk calculations are presented in **Table 6.7.7** for the child recreational user. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 6.9.7**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.7**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the child recreational user is 1.3. The estimated HI for surface water exposure is 0.004. The estimated HI for ingestion of fish as modeled for the Patapsco River Background Area is 0.4. The estimated HI for surface sediment exposure is 0.03. The estimated HI for ingestion of crab as modeled for the Patapsco River Background Area is 0.8. A breakdown by target organ is provided on **Table 6.10.7**. No target organ has an HI greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the child recreational user is 7.9 x 10^{-5}. The estimated risk for surface water exposure is 2.5 x 10^{-5}. The estimated risk for ingestion of fish as modeled for the Patapsco River Background Area is 1.7 x 10^{-5}. The estimated risk for surface sediment exposure is 5.7 x 10^{-7}. The estimated risk for ingestion of crab as modeled for the Patapsco River Background Area is 3.6 x 10^{-5}.

6.5.4 Watermen Results

Watermen are evaluated for dermal exposure to surface water and surface sediment, and ingestion of fish and crab. Risk calculations are presented in **Table 6.7.4**. A risk summary for this receptor is provided in **Table 6.9.4**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.4**.

6.5.4.1 Coke Point Offshore Area Watermen Results

Non-Carcinogenic Results

The total non-carcinogenic HI for the watermen is 2.5. The ingestion of crab pathway is the primary contributor to non-carcinogenic HI. The estimated HI for surface water exposure is 0.005. The estimated HI for watermen ingestion of fish as modeled for the Coke Point Offshore Area is 0.4. The estimated HI for surface sediment exposure is 0.03. The estimated HI for watermen ingestion of crab as modeled for the Coke Point Offshore Area is 2.0. A breakdown by target organ is provided on **Table 6.10.4**. The developmental system has an HI slightly greater than 1. In addition, dioxin in modeled crab is the only COPC with an HQ greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the watermen is 2.5 x 10^{-3}. The estimated risk for surface water exposure is 4.9 x 10^{-4}. The estimated risk for watermen ingestion of fish as modeled for the Coke Point Offshore Area is 7.4 x 10^{-4}. The estimated risk for surface sediment exposure is 9.6 x 10^{-6}. The estimated risk for watermen ingestion of crab as modeled for Coke Point Offshore Area is 1.3 x 10^{-3}. PAHs (benzo(a)pyrene and dibenz(a,h)anthracene) in surface water, modeled fish, and modeled crabs and total PCBs in modeled crabs have excess cancer risk above 10^{-4}.

6.5.4.2 Patapsco River Background Watermen Results

Patapsco River Background Area risk calculations are presented in **Table 6.7.8** for watermen. For background, this receptor is evaluated for the same exposure pathways as the Coke Point Offshore Area. A risk summary for this receptor is provided in **Table 6.9.8**, and a presentation of contributors to risk (carcinogenic risk greater than 1 x 10^{-6} or a HQ greater than 0.1) is provided in **Table 6.10.8**.

Non-Carcinogenic Results

The total non-carcinogenic HI for the watermen is 1.1. The estimated HI for surface water exposure is 0.003. The estimated HI for watermen ingestion of fish as modeled for the Patapsco

River Background Area is 0.4. The estimated HI for surface sediment exposure is 0.01. The estimated HI for watermen ingestion of crab as modeled for the Patapsco River Background Area is 0.7. A breakdown by target organ is provided on **Table 6.10.8**. No target organ has an HI greater than 1.

Carcinogenic Results

The excess cumulative carcinogenic risk calculated for the watermen is 2.2×10^{-4}. The estimated risk for surface water exposure is 1.5×10^{-5}. The estimated risk for watermen ingestion of fish as modeled for the Patapsco River Background Area is 4.8×10^{-5}. The estimated risk for surface sediment exposure is 1.1×10^{-6}. The estimated risk for watermen ingestion of crab as modeled for the Patapsco River Background Area is 1.6×10^{-4}. No COPCs have risk above 10^{-4}, total PCBs and dioxin in modeled crabs and PAHs in modeled fish and modeled crab are the primary contributors to excess cancer risks.

6.6 UNCERTAINTY EVALUATION

There are numerous uncertainties involved in the HHRA process. These are discussed briefly in the following sections. There are uncertainties associated with each step of the risk assessment process: Sampling and analysis, exposure assessment, exposure point concentration, dermal exposure values, toxicity assessment, and risk characterization. Where uncertainties are inherent in the USEPA guidance for the HHRA process and the USEPA has recommended or incorporated methods for addressing these uncertainties, the agency's findings have been incorporated into the HHRA. This is particularly true for uncertainties associated with the toxicity assessment and exposure routes. For the toxicity assessment, appropriate uncertainty factors are applied to toxicity values as set forth by the USEPA and discussed in Section 6.3 (USEPA 2010c). Where uncertainties are specifically associated with the design of this risk assessment, sensitivity analyses were conducted to better understand their significance (**Appendix G**).

6.6.1 Sampling and Analysis Uncertainties

The sampling plan can have a significant impact on the results obtained in calculating human health risks at a site. There are uncertainties associated with the data set used in the HHRA. In particular, surface water is a fluid medium and chemical concentrations may vary spatially and temporally. Uncertainty due to spatial and temporal variability is especially relevant to surface water results because surface water is subject to mixing and variable upstream input. To mitigate this uncertainty, sampling was designed specifically to provide data relevant to the HHRA. Sampling efforts targeted areas of suspected chemical contamination and the spatial resolution was selected to provide relevant results. Multiple depths and repeat sampling events were used to reduce variability in surface water. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

There is uncertainty associated with the use of data from multiple studies. To reduce this uncertainty, data from each study was reviewed for relevance and only validated, relevant data were utilized (as discussed in Section 3.1). It should be noted that data are available from other studies of the area that were not utilized in the HHRA due to uncertainties associated with

differences in study design, analytical methods, or data validation. In specific, data from a 2005 study of VOCs in surface water by Severstal were not included because they utilized a different study design, a limited analytical suite, and were not validated. Benzene concentrations from samples in this study ranged from non-detect to 0.330 mg/L. These concentrations are higher than those detected in the sampling conducted to support the HRA, which ranged from non-detect to 0.072 mg/L. These differences in chemical concentrations over time are a source of uncertainty.

There is also uncertainty associated with samples used to represent the Patapsco River Background Area. Background samples for surface sediment demonstrated substantial variability, with a range of concentrations for metals and PAHs, frequently spanning an order of magnitude. Given the variety of environments and potential sources to background, this is not necessarily unexpected. Because insufficient background samples were available to calculate a 95% UCLM, the maximum concentration in background sediment was used to represent the reasonable maximum exposure scenario. Interpretation of comparisons to background results should consider this conservative fact. To mitigate uncertainties associated with data for the Patapsco River Background Area, background concentrations are compared to concentrations in other far field samples in the Patapsco River. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

Use of tissue data from laboratory bioaccumulation studies presented in **Appendix H** reduces the potential uncertainty associated with food web exposure models used in the risk assessment when compared to use of literature-based BAFs. However, there are some uncertainties associated with these data. Laboratory bioaccumulation tests are conducted in a controlled environment. Because laboratory bioaccumulation test conditions may differ from those experienced by aquatic organisms in the field, bioaccumulation may differ and thus be over-estimated or under-estimated by laboratory bioaccumulation test results. To minimize this uncertainty, the sediment used for laboratory bioaccumulation tests was carefully selected to represent site-wide conditions as closely as possible, and standard test methods were used which utilize organisms and parameters representative of a range of situations.

There is also uncertainty associated with the concentrations of metals detected in the surface water samples from the investigation area. All of the surface water data included in the quantitative risk calculations were from unfiltered samples. As a result, the concentration of metals detected in surface water samples very likely include metals that are sorbed to suspended particulate matter (sediment). These sorbed metals are less available for uptake by receptors of concern. Therefore, the detected concentrations may not be representative of the amount of bioavailable metals, and the use of these water pathway data could overestimate the potential for risk from surface water related to metals.

6.6.2 Uncertainties Analysis of Exposure Assessment

An analysis of uncertainties is an important aspect of the exposure assessment. It provides the risk assessor and reviewer with information relevant to the individual uncertainties associated with exposure factor assumptions and their potential impact on the final assessment.

Conservative assumptions are made about exposure to these media that may result in an overestimate of potential health risks. The assumption that fishing and swimming occur with a long-term regularity in the offshore environment of this industrialized area is conservative. This uncertainty is further evaluated in a Sensitivity Analysis provided in **Appendix G**.

6.6.3 Exposure Point Concentrations

An uncertainty exists with the basic approach used in arriving at EPCs for the COPCs. The USEPA ProUCL program eliminates many uncertainties associated with EPC calculation; however, COPCs with low frequencies of detection still have uncertainties within ProUCL. For the Patapsco River Background Area, both the surface water and sediment dataset had less than 10 samples which prevented the calculation of a 95%UCLM for most chemicals. For most chemicals detected in the Patapsco River Background Area, the results are comparable to the MDL not the RL. The RL is used in the 95%UCLM calculation. Characterization of background EPCs is further evaluated in **Appendix G**, Sensitivity Analysis. In addition, potential human health risks associated with the use of the median concentration as the EPC are also presented in the Sensitivity Analysis, **Appendix G**.

6.6.4 Dermal Exposure Values

A variable used in the dermal exposure to sediment is the AF. The HHRA used the soil AFs for all receptor exposure to sediment. This is conservative because it is expected that most sediments contacted in the Coke Point Offshore Area would wash off and not stay on the skin area for extended periods of time. As a result, the conservative dermal exposure parameters used in the HHRA would compensate for any chemicals not assessed due to a lack of USEPA-recommended values.

The estimation of dermal exposure to surface water also contains a number of uncertainties that can affect the overall risk results (USEPA 2004). In estimating dermal exposure to surface water, a primary variable in the calculations is the PC. For organic chemicals, the PC is a function of the path length of chemical diffusion (the thickness of the stratum corneum), the membrane/vehicle partition coefficient of a chemical (the octanol/water partition coefficient, K_{ow}), and the effective diffusion coefficient for chemical transfer through the stratum corneum. The USEPA notes that chemicals with very large K_{ow} values are outside of an "Effective Prediction Domain" (EPD). The PAHs are a primary class of chemicals detected in surface water and have a very larger K_{ow}. Therefore, the predicted PC used in the dermal exposure calculations is not within the EPD and cannot be verified by statistical analysis. The use of the predicted PC in the dermal exposure calculations results in a potential over-estimation of potential risks to receptors.

In addition, the estimation of dermal exposures assumes that absorption of chemicals continues long after exposure has ended. Therefore, the final absorbed dose (DA_{event}) is the total dose dissolved in the skin at the end of exposure. Chemicals that are lipophilic or exhibit a long lag time are assumed that some of the chemical absorbed into the skin is lost due to skin shedding (desquamation). To account for this loss, the dermal exposure model takes into account a fraction absorbed (FA). For a majority of the PAHs evaluated in the HHRA, the FA is assumed

at 100 percent. The assumption that 100 percent of the chemical is absorbed may lead to an over-estimation of the dermal exposure to surface water risk results.

6.6.5 Uncertainties of Toxicity Assessment

There are numerous uncertainties associated with the toxicity assessment. These are generally due to the unavailability of data to thoroughly calculate the toxicity of COPCs. These uncertainties are described in more detail in the following sections.

6.6.5.1 Uncertainties Associated With Non-Carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information comes from experiments with laboratory animals. Experimental animal data have been relied on by regulatory agencies to assess the hazards of chemical exposures to humans. Interspecies differences in chemical absorption, metabolism, excretion, and toxic response are not well understood; therefore, conservative assumptions are applied to animal data when extrapolating to humans. These probably result in an overestimation of toxicity.

Intraspecies Extrapolation

Differences in individual human susceptibilities to the effects of chemical exposures may be caused by such variables as genetic factors (e.g., glucose-6-phosphate dehydrogenase deficiency), lifestyle (e.g., cigarette smoking and alcohol consumption), age, hormonal status (e.g., pregnancy), and disease. To take into account the diversity of human populations and their differing susceptibilities to chemically induced injury or disease, a safety factor is used. USEPA uses a factor between 1 and 10. This uncertainty may lead to overestimates of human health effects at given doses.

Exposure Routes

When experimental data available on one route of administration are different from the actual route of exposure that is of interest, route-to-route extrapolation must be performed before the risk can be assessed. Several criteria must be satisfied before route-to-route extrapolation can be undertaken. The most critical assumption is that a chemical injures the same organ(s) regardless of route, even though the injury can vary in degree. Another assumption is that the behavior of a substance in the body is similar by all routes of contact. This may not be the case when, for example, materials absorbed via the gastrointestinal tract pass through the liver prior to reaching the systemic circulation, whereas by inhalation the same chemical will reach other organs before the liver. However, when data are limited, these extrapolations are made and may result in overestimates of human toxicity.

6.6.5.2 Uncertainties Associated With Carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information for carcinogenic assessments comes from experiments with laboratory animals. There is uncertainty about whether animal carcinogens are also

carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a very small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animal species but not in others raises the possibility that not all animal carcinogens are human carcinogens. Regulatory agencies assume that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimation of risk, introduces the potential to overestimate carcinogenic risk.

High-Dose to Low-Dose Extrapolation

Typical cancer bioassays provide limited low-dose data on responses in experimental animals for chemicals being assessed for carcinogenic or chronic effects. The usual dose regime involves three dose groups per assay. The first dose group is given the highest dose that can be tolerated, the second is exposed to one-half that dose, and the third group is unexposed (control group). Because this dosing method does not reflect how animals would react to lower doses of a chemical, a dose-response assessment normally requires extrapolation from high to low doses using mathematical modeling that incorporates to varying degrees information about physiologic processes in the body.

A central problem with the low-dose extrapolation models is that they all too often fit the data from animal bioassays equally well, and it is not possible to determine their validity based on goodness of fit. Several models may fit experimental data equally well, but all may not be equally plausible biologically. The dose-response curves derived from different models diverge substantially in the dose range of interest. Therefore, low-dose extrapolation is more than a curve-fitting process, and considerations of biological plausibility of the models must be taken into account before choosing the best model for a particular set of data.

6.6.6 Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation; the exposure assessment process, including any modeling of exposure point concentrations in secondary media from primary media; and the toxicity assessment process. The individual uncertainties in these respective processes are addressed in previous sections. Another uncertainty in the risk characterization is the summation of chemical-specific risk results across media of concern. The summation assumes an additive effect across media and all exposure pathways for each receptor. However, the summation does not take into account certain aspects. For carcinogenic risks, the summation does not take into account the weight of evidence of carcinogenicity, SFs derived from animal data are given the same weight as SFs derived from human data, and the action of two different carcinogens might not be independent. For non-carcinogenic hazards, the uncertainty of summing across media of concern is reduced through the use of target organ endpoints. In addition, cumulative risk results are provided for each receptor that sum risks across all media of concern. This presents an uncertainty because receptors may not contact all media of concern while in the offshore area.

6.7 HHRA-SC SUMMARY

The HHRA-SC evaluates the potential cumulative risks for the adult recreational user, adolescent recreational user, child recreational user, and watermen for exposure to surface water, sediment, and fish and crab concentrations. The HHRA-SC evaluated both the Coke Point Offshore Area and the Patapsco River Background Area. Specific pathways evaluated are presented in **Figure 2.2**.

The HHRA-SC provides an evaluation of human health risks that will aid the MPA with internal decision making for future site planning and determining potential remediation requirements. The HHRA-SC provides a theoretical maximum exposure that provides conservative indication of potential contribution from offshore sediment and surface water. The HHRA-SC focuses on exposures limited to the Coke Point Offshore Area and analyze crab and fish consumption based on site-specific data. The HHRA-SC relies on site-specific bioaccumulation studies to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption. Potential receptor exposure to surface water, sediment, modeled fish tissue, and modeled crab tissue are evaluated. This HHRA evaluates potential risk contributions specifically from the offshore area evaluated without regard to the actual use of the area. The following tables present a summary of the HHRA-SC risk results:

Risk Assessment for Source Characterization and Site Planning
Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$2.7x10^{-6}$	$9.2x10^{-4}$	$1.0x10^{-3}$	$6.1x10^{-4}$	$2.6x10^{-3}$
Adolescent Recreational User	$1.2x10^{-5}$	$1.1x10^{-3}$	$9.7x10^{-4}$	$7.0x10^{-4}$	$2.7x10^{-3}$
Child Recreational User	$5.9x10^{-6}$	$3.9x10^{-4}$	$3.6x10^{-4}$	$2.6x10^{-4}$	$1.0x10^{-3}$
Watermen	$9.6x10^{-6}$	$4.9x10^{-4}$	$1.3x10^{-3}$	$7.4x10^{-4}$	$2.5x10^{-3}$
Patapsco River Background Area					
Adult Recreational User	$3.0x10^{-7}$	$5.8x10^{-5}$	$1.3x10^{-4}$	$4.0x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.1x10^{-6}$	$6.7x10^{-5}$	$9.7x10^{-5}$	$4.5x10^{-5}$	$2.1x10^{-4}$
Child Recreational User	$5.7x10^{-7}$	$2.5x10^{-5}$	$3.6x10^{-5}$	$1.7x10^{-5}$	$7.9x10^{-5}$
Watermen	$1.1x10^{-6}$	$1.5x10^{-5}$	$1.6x10^{-4}$	$4.8x10^{-5}$	$2.2x10^{-4}$

Risk Assessment for Source Characterization and Site Planning
Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.01	0.006	1.7	0.3	2.0
Adolescent Recreational User	0.04	0.006	1.9	0.4	2.4
Child Recreational User	0.07	0.008	2.4	0.5	3.0
Watermen	0.03	0.005	2.0	0.4	2.5
Patapsco River Background Area					
Adult Recreational User	0.003	0.003	0.6	0.3	0.9
Adolescent Recreational User	0.02	0.004	0.7	0.3	1.0
Child Recreational User	0.03	0.004	0.8	0.4	1.3
Watermen	0.01	0.003	0.7	0.4	1.1

As shown in the summary tables, cumulative calculated risk for all receptors to the Coke Point Offshore Area are above the USEPA target excess carcinogenic risk range of 10^{-4} to 10^{-6}. Non-carcinogenic risks are also above the threshold HI of 1. In addition, carcinogenic risks and non-carcinogenic hazards for the Coke Point Offshore Area are elevated above the Patapsco River Background Area. Risk results for the ingestion of fish and crab reveal that surface water and sediment within the Coke Point Offshore Area have the potential to contribute chemicals to the local food chain.

For all receptors, the consumption of modeled crab and fish tissue and dermal exposure to surface water are the primary pathway contributing to carcinogenic and non-carcinogenic risks. **Tables 6.10.1** through **6.10.4** present the COPCs that contribute to calculated risk for the Coke Point Offshore Area. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in modeled fish and crab tissue, surface water and total PCBs in modeled crab tissue are significant contributors. Dioxin and naphthalene are the primary contributor to non-carcinogenic hazards.

For the Patapsco River Background Area, cumulative carcinogenic risk results are above the USEPA target excess carcinogenic risk range of 10^{-4} to 10^{-6}. For the Patapsco River Background area, the consumption of crab is a primary contributor to overall cumulative carcinogenic risks. Dermal contact with surface water and consumption of fish also contributes to carcinogenic risk results. Total PCBs in modeled crabs and PAHs in surface water and modeled fish are the primary chemicals that contribute to carcinogenic risk results. **Tables 6.10.5** through **6.10.8** present the chemicals that contribute to calculated risks for the Patapsco River Background Area.

A primary contributor to cumulative carcinogenic risks is the dermal contact with surface water exposure pathway. The risk results for this pathway present a number of uncertainties that need to be taken into account in any risk management decisions. PAHs are the only class of chemicals that contribute to the carcinogenic risks determined for the surface water exposure pathway. The USEPA dermal guidance (USEPA 2004) notes that the PCs (permeability coefficients) estimated for PAHs are outside of a predictive range and cannot be verified. As a result, the actual

absorbed dose of PAHs through the skin is most likely over-estimated. Additionally, the surface water exposure pathway also estimates potential risks for exposure to the entire offshore study area around the Coke Point Peninsula, including water within the turning basin and along the Coke Point shoreline. The use of the USEPA ProUCL program takes into account sample results over the entire exposure area to eliminate some uncertainty and determine the concentration contacted over the entire area, including samples with non-detects. However, actual PAH detections in surface water are spatially limited. **Figures 3.13** through **3.15** of the risk assessment present the detected PAH concentrations, as represented by benzo(a)pyrene. PAHs are highest in surface water locations immediately offshore of Coke Point Peninsula at locations BH-W-06 and BH-W-10B. These locations are not expected to attract recreational swimmers based on current site conditions. Furthermore, surface water PAH detections are not consistently detected throughout the study area which is a result of typical surface water movement and influences from other conditions, including groundwater discharge, tidal flow, etc. Due to these limitations, potential carcinogenic risks for dermal contact with surface water are likely over-estimated. The results of the HHRA should be used in context with the known groundwater contamination discharge to surface water to determine risk management decisions for potential human health concerns and potential design considerations. The Site Assessment noted that impacted groundwater fluxes from the northwestern and eastern parts of the Coke Point Peninsula to the adjacent Patapsco River and Turning Basin. This discharge of groundwater to surface water has negatively affected surface water quality (EA 2009b). Additionally, sediments along the Coke Point shoreline are impacted with residual NAPL and are have the potential to be disturbed along the shoreline by wave action (EA 2009b). Both factors could potentially contribute elevated concentrations of PAHs to surface water and act as a continual source.

7. CONCLUSIONS

The risk assessment of the Coke Point Offshore Area characterizes risks to both ecological systems and to people who would have access to the offshore area under existing conditions. The risk assessment does not evaluate future hypothetical risks that could occur if site conditions change; such changes would include redistribution of chemical concentrations in the sediment profile due to erosion or mixing. The risk assessment is intended to satisfy three basic purposes:

- to characterize offshore area-related risks, which may require remediation;
- to provide a baseline for quantifying the potential risk reduction benefit of the project;
- and, to provide risk information that may aid in project design.

The following sections summarize the risk assessment results, and present overall conclusions and recommendations.

7.1 SPATIAL DISTRIBUTION OF CHEMICALS

Spatial distribution of chemical concentrations was evaluated in relation to background concentrations to aid in interpreting risk assessment results. Spatial analysis revealed that, for many metals (i.e., arsenic, copper, lead, zinc, etc.), PCBs, and PAHs, chemical concentrations in surface sediment are 1 to 2 times higher than background within a roughly 1,000-ft buffer along the Coke Point shoreline. Concentrations of these metals are elevated up to five times or more above background in surface sediment in two general areas: the area to the south and west of the mouth of the Turning Basin, especially at locations BH-SED-10 and BH-SED-10B; and the area west of the Coke Oven Area along the transect associated with sample BH-SED-03.

In surface water, chemical concentrations of HMW PAHs, toluene, and ethylbenzene were detected at concentrations elevated above those in the Patapsco River Background Area. Concentrations of toluene and ethylbenzene in surface water are highest at locations immediately offshore of Coke Point and along the shoreline. Concentrations of HMW PAHs are highest in surface water at locations immediately offshore of Coke Point at locations BH-W-06 and -10B. High concentrations along the shoreline are consistent with expected fate and transport pathways for these chemicals in water, which may originate from groundwater seeps or dissolution from sediment disturbed by wave action (EA 2009b).

7.2 RESULTS OF THE ECOLOGICAL RISK ASSESSMENT

An ERA is a process in which exposure and toxicity data are combined to develop an estimate of the potential for adverse impacts on ecological receptors including fish, invertebrates, and wildlife from chemicals in the environment. The ERA for the Coke Point Offshore Area was conducted in accordance with applicable USEPA guidance (USEPA 1997a). The ERA provided separate assessments of risks for two assessment endpoints:

- Viability of aquatic and benthic organism communities, and
- Viability of wildlife communities including piscivorous (fish-eating) birds and mammals.

Per USEPA guidance (USEPA 1997a), the ERA began with a precautionary evaluation of the potential for risks based on screening exposure scenarios. However, it also incorporated more refined evaluation methods, such as reasonable maximum exposure scenarios, consideration of background risks, and discussion of site-specific habitat, wildlife mobility, and bioavailability considerations. The ERA applied a weight-of-evidence approach for each assessment endpoint evaluated. In a weight-of-evidence approach, multiple lines of evidence are evaluated, and their individual significance, or weight, is considered to derive a conclusion. Each line of evidence is a measurement endpoint. Exposure and toxicity assessments were conducted to compile the data necessary to evaluate each of these endpoints.

7.2.1 Assessment of Risks for Aquatic and Benthic Organisms

For aquatic and benthic organisms, the ERA evaluatedseveral measurement endpoints as part of a weight-of-evidence approach. These include comparisons of EPCs in surface sediment and surface water to toxicological benchmarks; comparison of offshore concentrations of chemicals to background concentrations; and consideration of bioavailability based on sediment chemical testing and laboratory bioaccumulation test results. Subsurface sediment was not evaluated in the ERA. Exposure pathways for subsurface sediment are considered incomplete in this evaluation of current conditions.Potential future risk as a result of erosion or dredging was not considered in the ERA.

Results of the ecological risk assessment for aquatic and benthic organisms are provided in the table below. For surface sediments, the results of the risk assessment indicated that concentrations of chemicals in surface sediment at Coke Point exceed both benchmarks protective of aquatic and benthic organisms as well as background concentrations. Comparison based on surface sediment concentrations identified metals, PAHs, and PCBs as exceeding threshold and probable effects benchmarks and background risks. These comparisons provide a strong indication that chemical concentrations in sediments in the Coke Point Offshore Area potentially cause risk to aquatic and benthic organisms that cannot be readily attributed to background sources in the Patapsco River. Arsenic, chromium, copper, lead, mercury, zinc, dioxins, HMW PAHs, low molecular weight (LMW) PAHs, and PCBs were identified as the chemicals most likely to cause risks. Site-specific bioavailability information indicated that risk from other metals may be somewhat overestimated because these metals may bind to sediment in forms that are less toxic. This information was used to focus the list of metals identified as posing risks.

For surface water, the ecological risk assessment also indicated that, whilemaximum surface water concentrations of a few chemicals at the Coke Point Offshore Area exceed benchmarksand background risks, overall risks are relatively low and are generally comparable to background with the exception of risks for PAHs. Comparisons based on surface water concentrations identifiedseveral metals, ethylbenzene, toluene, and PAHs as exceeding benchmarks. Reasonable maximum case scenario concentrations were generally comparable between the Coke Point Offshore Area and the Patapsco River Background Area or do not exceed benchmarks, with the exception of PAHs. Therefore, the assessment concludes that PAHs are the only chemicals in surface water at Coke Point that are predicted to pose risks to aquatic and benthic organisms above those risks already posed by background sources.

The finding of the ERA is that aquatic and benthic organisms are potentially at risk from metals, PAHs, and PCBs in surface sediment at the Coke Point Offshore Area. Arsenic, chromium, copper, lead, mercury, zinc, PAHs, and PCBs in sediment were considered the chemicals most likely to drive risks, although high concentrations of PAHs in surface water in near-shore areas also contribute to risks. Chemical concentrations in surface sediment throughout the offshore area are elevated and contribute to risks to aquatic and benthic organisms.

Summary of Ecological Risk Results for Aquatic and Benthic Organisms

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		Qualitative Factors
	Chemicals Exceeding Benchmarks[A]	Chemicals Exceeding Both Benchmarks &Background[B]	Chemicals Exceeding Benchmarks[A]	Chemicals Exceeding Both Benchmarks &Background[B]	
AQUATIC AND BENTHIC ORGANISMS					
Sediment exposures	**Aluminum (1.39)** **Antimony (1.65)** **Arsenic (9.94)** **Cadmium (11.4)** **Chromium (9.64)** **Cobalt (5.30)** **Copper (31.8)** **Iron (6.00)** **Lead (42.3)** **Manganese (3.46)** **Mercury (13.1)** **Nickel (3.55)** Selenium (12.3) **Silver (3.84)** Tin (58.8) Vanadium (2.98) **Zinc (22.0)** **HMW PAH (440)** **LMW PAH (23,300)** PCBs (8.17) **TCDD TEQ (51.4)**	Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Cadmium [4.81] Chromium [2.24] Cobalt [2.68] Copper [5.67] Iron [2.74] Lead [10.58] Manganese [1.26] Mercury [4.36] Nickel [1.51] Selenium [5.13] Silver [2.98] Tin [5.19] Vanadium [1.80] Zinc [6.36] HMW PAH [33.3] LMW PAH [468] PCBs [8.38] TCDD TEQ [3.79]	Aluminum (1.23) Arsenic (3.82) Cadmium (4.39) **Chromium (4.52)** Cobalt (2.94) **Copper (9.20)** **Iron (3.82)** **Lead (11.6)** **Manganese (2.76)** Mercury (5.28) Nickel (2.68) Selenium (4.61) Silver (1.90) Tin (25.1) Vanadium (2.04) **Zinc (8.06)** **HMW PAH (132)** **LMW PAH (7,050)** PCBs (5.52) TCDD TEQ (20.2)	Aluminum [1.09] Arsenic [2.57] Cadmium [2.58] Chromium [1.16] Cobalt [1.48] Copper [1.88] Iron [2.79] Lead [3.32] Manganese [1.01] Mercury [3.02] Nickel [1.74] Selenium [1.92] Silver [1.61] Tin [2.21] Vanadium [1.23] Zinc [2.66] HMW PAH [10.0] LMW PAH [141.3] PCBs [4.98] TCDD TEQ [2.10]	- -Bioaccumulation tests indicate that metals, PAHs, and PCBs are at least partially bioavailable based on observed uptake. - Analyses of sediment indicate that sulfides may bind some metals and decrease their toxicity compared to that assumed in toxicity benchmarks.
Surface water exposures	Aluminum (1.04) Manganese (1.65) Zinc (1.04) HMW PAH (5,420) LMW PAH (3.85) Ethylbenzene (5.48) Toluene (1.53)	Manganese [2.32] Zinc [9.40] HMW PAH [58.9] LMW PAH [4.71]	HMW PAH (438) LMW PAH (1.08)	HMW PAH (ND=DL) [4.76]	

Bolded chemicals in the list of exceedences indicate that concentrations exceed probable effects benchmarks in addition to threshold effects benchmarks; this provides a more definite indication of risks.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

7.2.2 Assessment of Risks for Wildlife

The CSM for Coke Point identified the viability of wildlife, including birds and mammals, as an assessment endpoint for protection. Great blue heron, osprey, raccoon, and river otter were selected as specific representative receptor species. Because wildlife may be exposed to multiple media via the food web, measurement endpoints for wildlife were based on food web modeling

to estimate ingested doses. Measurement endpoints evaluated for wildlife include comparisons of doses fromprey, surface sediment and surface water to toxicological benchmarks; comparison of offshore doses of chemicals to background doses; and consideration of bioavailability based on sediment chemical testing and laboratory bioaccumulation test results.

The ERA evaluated exposure scenarios based on ingestion of three types of prey (benthos, fish, and crabs). Tissue concentrations representative of benthos were developed using site-specific bioaccumulation factors (BAFs), while tissue concentrations representative of fish and crab were calculated from analyses of specimens field-collected from the areas to be assessed. There are advantages to each of these two methods for calculating tissue concentrations. Laboratory bioaccumulation tests are a highly reliable means of linking exposure to chemical concentrations in sediment to concentrations accumulated in tissue because uptake is not influenced by the mobility of organisms or variations in field conditions. Thus, scenarios based on BAFs from laboratory bioaccumulation tests provide the most reliable measure of potential contributions from chemical sources in Coke Point sediments to regional exposures and risks. Alternatively, concentrations derived from field-collected tissue are more likely to incorporate the influence of field variations and organism movement beyond the site and provide a more reliable measure for predicting the actual exposures experienced by people and wildlife consuming these organisms from the site. Different scenarios were evaluated so that the advantages of each data source could be used to interpret risk assessment results.

The ERA evaluated five lines of evidence, called measurement endpoints, to characterize risks to wildlife. These included:

- Comparison of modeled food web doses to no-effect and low-effectbenchmarks for birds and mammals using a precautionary screening level scenario assuming exposures to maximum detected concentrations.

- Comparison of modeled food web doses to no-effect and low-effectbenchmarks for birds and mammals using a reasonable maximum scenario based on statistically derived mean concentrations.

- Comparison of risk estimates for the Coke Point Offshore Area to risks for the Patapsco River Background Area.

- Comparison of reasonable maximum scenariofood web doses to no-effect and low-effectbenchmarks after they have been modified with Area Use Factors (AUFs) that account for wildlife movement.

- Qualitative evaluation of chemical bioavailability in sediment.

The first measurement endpoint – evaluation of risks using a precautionary screening scenario – identified numerous chemicals in the Coke Point Offshore Area whose doses exceeded both no-effects and low-effects benchmarks. These included metals, dioxins, PAHs, and PCBs. However, the screening scenario is not representative of most exposures experienced by wildlife, and represents a conservative worst case scenario. The reasonable maximum scenario is more reflective of actual exposures within the project site boundary, and the reasonable maximum exposure scenario modified to account for wildlife mobility and area use is likely to be most

representative of actual exposures. When a reasonable maximum exposure scenario is considered, several metals, dioxins, PCBs, and PAHs produce doses that exceed no-effects benchmarks, but only the doses of several metals and PCBs exceed low-effects benchmarks. Exceedence of a low-effect benchmark is a more definite indicator of risk, while exceedence of a no-effect benchmark indicates that a risk is possible, but not definite. When area use and wildlife mobility were factored into exposures, doses of PCBs and a few metals exceeded low-effects level benchmarks.

Comparison of risks between the Coke Point Offshore Area and Patapsco River Background Area indicates that risks to wildlife from PAHs, PCBs, dioxins, and some metals are higher near Coke Point. Risks from many of the metals that produced doses above benchmarks for reasonable maximum scenarios at Coke Point are similar to those in background, indicating that these risks are not limited to Coke Point sources. Alternative statistical evaluation of background data were found to decrease background risks by an order of magnitude as documented in **Appendix G**, thus increasing the difference between ecological risks in the Coke Point Offshore Area and risks in the Patapsco River Background Area.

Taken together, the lines of evidence indicate that the PCBs and PAHs are the chemicals driving risks for the Coke Point Offshore Area. Metals, dioxins, and VOCs are not considered risk drivers because they demonstrate reasonable maximum scenario risks that are either comparable to background risks or below low-effects level benchmarks. PCBs are a site-related COC because both no-effects level benchmark and low-effects level benchmark reasonable maximum scenario risks are above acceptable levels and because risks for exposures to some prey types are greater than those in background. It must be noted however, that exposure pathways based on ingestion of crab produced higher risks for background. HMW PAHs and LMW PAHs were considered to be site-related risk drivers, but with a limited potential for impacts under maximum exposure scenarios only. Impact was considered limited because reasonable maximum scenario doses of PAHs exceed no-effects level benchmarks but not low-effects level benchmarks. HMW PAHs and LMW PAHs were maintained as risk drivers because both tissue concentrations and doses are higher in the Coke Point Offshore Area than in the background area and because screening level scenarios produce low-effects level benchmark exceedences.

The finding of the ERA is that wildlife which consume aquatic and benthic organisms are potentially at risk from chemicals insurface sediment at the Coke Point Offshore Area. The chemicals driving risks are PCBs, HMW PAHs, and LMW PAHs. HMW PAHs and LMW PAHs are also considered to be site-related risk drivers, but with a limited potential for impacts under maximum exposure scenarios only. Metals, dioxins, and VOCs are not considered risk drivers because they demonstrate reasonable maximum scenario exposures that are either comparable to background or below low-effect level benchmarks.

Summary of Ecological Risk Results for Avian Wildlife

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		
	Chemicals Exceeding No-Effects Level Benchmark[A]	**Chemicals Exceeding No-Effects Levels&Background[B]**	**Chemicals Exceeding No-Effects Level Benchmark[A]**	**Chemicals Exceeding No-Effects Levels&Background[B]**	**Chemicals Exceeding Low-Effects Level Benchmark[A]**
AVIAN WILDLIFE: GREAT BLUE HERON					
Modeled exposures using prey uptake from benthic organisms	Lead (1.22) Vanadium (5.26) HMW PAHs (2.68) LMW PAHs (11.4) PCBs (3.38)	Lead [10.6] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [165] PCBs [8.38]	***Vanadium (3.59)*** LMW PAHs (3.25) PCBs (1.83)	Vanadium [1.23] LMW PAHs [48.1] PCBs [4.98]	No LOAEL chemical exceedances
Modeled exposures using field-collected crabs	LMW PAH (2.00)	LMW PAHs [334]	No NOAEL chemical exceedances	No chemical exceedances	No LOAEL chemical exceedances
Modeled exposures using field-collected fish	Copper (1.65) Selenium (1.16) LMW PAH (1.99)	Copper [1.41] Selenium [1.32] LMW PAHs [314]	***Copper (1.39)*** Selenium (1.07)	Copper [1.34] Selenium [1.27]	No LOAEL chemical exceedances
AVIAN WILDLIFE: OSPREY					
Modeled exposures using prey uptake from benthic organisms	Lead (1.42) Vanadium (6.13) HMW PAHs (3.12) LMW PAHs (13.3) PCBs (3.94)	Lead [10.6] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [165] PCBs [8.38]	Vanadium (4.19) LMW PAHs (3.79) PCBs (2.14)	Vanadium [1.23] LMW PAHs [48.1] PCBs [4.98]	No LOAEL chemical exceedances
Modeled exposures using field-collected crabs	LMW PAH (2.33)	LMW PAHs [334]	No NOAEL chemical exceedances	No chemical exceedances	No LOAEL chemical exceedances
Modeled exposures field-collected fish	Copper (1.92) Selenium (1.35) LMW PAH (2.33)	Copper [1.41] Selenium [1.32] LMW PAHs [314]	Copper (1.63) Selenium (1.25)	Copper [1.34] Selenium [1.27]	No LOAEL chemical exceedances

Bold and italic- indicates a chemical exceedence after home range area use factor is applied.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

Summary of Ecological Risk Results for Mammalian Wildlife

Receptor of Concern	Screening Exposure Scenario		Reasonable Maximum Exposure Scenario		
	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding No-Effects Level Benchmark[A]	Chemicals Exceeding No-Effects Levels&Background[B]	Chemicals Exceeding Low-Effects Level Benchmark[A]
MAMMALIAN WILDLIFE: RACCOON					
Modeled exposures using prey uptake from benthic organisms	TCDD TEQ (3.69) Aluminum (79.6) Antimony (1.39) Arsenic (2.78) Chromium (1.38) Lead (1.60) Selenium (3.37) Thallium (1.70) Vanadium (1.64) HMW PAHs (55.4) LMW PAHs (2.21) PCBs (255)	TCDD TEQ [2.48] Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Chromium [2.24] Lead [10.6] Selenium [5.07] Thallium [3.49] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [167] PCBs [8.38]	***TCDD TEQ (1.46)*** ***Aluminum (70.3)*** ***Arsenic (1.07)*** Selenium (1.27) ***Vanadium (1.12)*** ***HMW PAHs (13.5)*** ***PCBs (138)***	TCDD TEQ [1.04] Aluminum [1.09] Arsenic [2.58] Vanadium [1.23] HMW PAHs [11.0] PCBs [4.98]	***Aluminum (7.03)*** ***PCBs (14.0)***
Modeled exposures using field-collected crabs	Aluminum (46.8) Arsenic (1.05) Copper (1.88) Selenium (5.42) HMW PAH (2.11) PCBs (16.0)	Aluminum [1.25] Arsenic [1.20] HMW PAHs [40.5]	Aluminum (41.3) Copper (1.41) Selenium (4.88) PCBs (15.1)	Aluminum [1.11]	***Aluminum (4.13)*** ***Selenium (2.12)*** ***PCBs (1.53)***
Modeled exposures field-collected fish	Aluminum (55.6) Antimony (1.15) Copper (4.50) Lead (1.04) Selenium (8.87) Thallium (1.32) HMW PAH (2.02) PCBs (42.3)	Antimony [1.28] Copper [1.41] Lead [7.07] Selenium [1.32] Thallium [10.2] HMW PAHs [42.4] PCBs [1.18]	***Aluminum (49.4)*** ***Copper (3.81)*** ***Selenium (8.22)*** Thallium (1.13) ***PCBs (40.9)***	Copper [1.34] Selenium [1.27] Thallium [8.69] PCBs [1.14]	***Copper (1.38)*** ***Selenium (3.56)*** ***PCBs (4.14)***
MAMMALIAN WILDLIFE: RIVER OTTER					
Modeled exposures using prey uptake from benthos	TCDD TEQ (3.47) Aluminum (74.9) Antimony (1.31) Arsenic (2.62) Chromium (1.30) Lead (1.50) Selenium (3.18) Thallium (1.60) Vanadium (1.55) HMW PAHs (52.1) LMW PAHs (2.08) PCBs (240)	TCDD TEQ [2.48] Aluminum [1.23] Antimony [1.94] Arsenic [4.44] Chromium [2.24] Lead [10.6] Selenium [5.07] Thallium [3.49] Vanadium [1.80] HMW PAHs [44.1] LMW PAHs [167] PCBs [8.38]	***TCDD TEQ (1.37)*** ***Aluminum (66.2)*** Arsenic (1.01) Selenium (1.19) Vanadium (1.06) ***HMW PAHs (12.8)*** ***PCBs (130)***	TCDD TEQ [1.04] Aluminum [1.09] Arsenic [2.58] Selenium [1.91] Vanadium [1.23] HMW PAHs [11.0] PCBs [4.98]	***Aluminum (6.62)*** ***PCBs (13.2)***
Modeled exposures using prey uptake from crabs	Aluminum (44.0) Copper (1.77) Selenium (5.10) HMW PAH (1.99) PCBs (15.1)	Aluminum [4.44] Copper [3.28] Selenium [3.53] HMW PAHs [144] PCBs [2.65]	Aluminum (38.9) Copper (1.32) Selenium (4.60) PCBs (14.3)	Aluminum [1.11]	***Aluminum (3.89)*** ***Selenium (1.99)*** ***PCBs (1.44)***
Modeled exposures using prey uptake from fish	Aluminum (52.3) Antimony (1.08) Copper (4.24) Selenium (8.35) Thallium (1.25) HMW PAH (1.90) PCBs (39.8)	Aluminum [3.02] Antimony [4.56] Copper [5.03]Selenium [4.68] Thallium [36.0] HMW PAHs [150] PCBs [4.19]	***Aluminum (46.5)*** ***Copper (3.58)*** ***Selenium (7.74)*** Thallium (1.06) ***PCBs (38.5)***	Copper [1.34] Selenium [1.27] Thallium [8.68] PCBs [1.14]	***Copper (1.30)*** ***Selenium (3.35)*** ***PCBs (3.89)***

Bold and italic- indicates a chemical exceedence after area use factor is applied.

[A] Value in parentheses is the ratio of the concentration or dose to no-effects benchmarks; values greater than 1 indicate a potential for risk. Only chemicals with a value greater than 1 are presented in the table.

[B] Value in brackets is the ratio of the concentration (dose) of chemicals in the offshore area exceeding benchmarks to the concentration (dose) in background. Only chemicals with a value greater than 1 are presented in the table.

Summary of Ecological Risks

The conclusion of the ecological risk assessment is that specific chemicals in surface sediments of the Coke Point Offshore Areamay pose risks to ecological receptors and that those risks are greater than the background risks posed in the Patapsco River Background Area. A primary contributor to this risk is the accumulation of chemicals from sediment into benthic organisms. Concentrations of PAHs and PCBs in surface sediment are elevated in the offshore area. Therefore, chemicals in surface sediment and benthic tissues are considered the primary risk drivers.PCBs are identified as the chemicals most likely to cause risks. LMW PAHs and HMW PAHs are also identified as risk drivers, but with a limited potential for impacts associated primarily with the areas of highest exposure/highest concentrations.

7.3 RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT

The offshore area around the Coke Point Peninsula was evaluated in two separate HHRAs. The Risk Assessment for Public Health Impacts (HHRA-PH) characterized human exposures given the current conditions of the offshore area. Currently, the offshore area around Coke Point is not expected to be frequently used for swimming or other water activities, and it is expected that people would visit other, more easily accessible areas available in close proximity to Coke Point Offshore Area (e.g., state parks, private docks, etc.). However, there are no controls against these activities, so there is a potential for these activities to occur. This exposure scenario took into account exposures modeled in previous RCRA-related investigations and consultation with site-specific USEPA and MDE inputs (ISG 2005 and USEPA/MDE 2011a). The HHRA-PH provides an estimate of a site-specific exposure that takes into account the mobility of aquatic organisms in the offshore area by evaluating sample results from studies of field-collected crab and fish tissue. The results of the HHRA-PH provide a long-term risk characterization of the people fishing/crabbing in the area under current conditions.

The Risk Assessment for Source Characterization and Site Planning (HHRA-SC) provides an evaluation of human health risks that will aid the MPA with internal decision making for future site planningand determining potential remediation requirements.The HHRA-SC provides a theoretical maximum exposure that provides conservative indication of potential contribution to risk from offshore sediment and surface water.The HHRA-SC focused on exposures limited to the Coke Point Offshore Area and analyzes crab and fish consumption based on site-specific data. The HHRA-SC relied on site-specific bioaccumulation studies to assess the contribution of the Coke Point Offshore Area to risk associated with fish and crab consumption.Potential receptor exposure to surface water, sediment, modeled fish tissue, and modeled crab tissue were evaluated. This HHRA evaluated potential risk contributions specifically from the offshore area evaluated without regard to the actual human use of the area.

Potential cumulative risks for both the HHRA-PH and the HHRA-SC were calculated for the adult recreational user, adolescent recreational user, child recreational user, and watermen for exposure to surface water, sediment, and fish and crab concentrations. Both the Coke Point Offshore Area and the Patapsco River Background Area were evaluated for all receptors and exposures.

For both of the HHRAs, quantitative risk estimates were compared to MDE and USEPA risk thresholds. These comparisons aid in making risk management decisions for the site. For excess carcinogenic risk results, the USEPA defines the range of 10^{-4} to 10^{-6} as a target risk range. Cumulative carcinogenic risks that are below the lower end of the risk range (10^{-6}) typically do not require further action. Cumulative carcinogenic risks within the target range may require risk management decisions; however, cumulative or individual exposure pathway carcinogenic risks above the upper end of the target range (10^{-4}) typically require additional actions or consideration. Additionally, MDE considers cumulative carcinogenic risks greater than 10^{-5} as levels that may require remedial actions.

For non-carcinogenic hazards, MDE and USEPA have identified a target value of 1 (USEPA 1989). Per input from USEPA, non-carcinogenic values below 1.5 were considered acceptable because they round to 1 (USEPA 2011b). Cumulative non-carcinogenic hazards above this threshold identify potential concerns with chemicals that may affect specific organs or systems (e.g., reproductive system, developmental, etc.) within the body. If cumulative non-carcinogenic hazards exceed the threshold, target organs or systems associated with Chemicals of Potential Concern (COPCs) are identified. If the COPCs affect the same target organ, there may be concern that potential adverse health effects will be observed. In general, the greater the value of the non-carcinogenic hazards above the threshold, the greater the level of concern. However, results above the threshold do not represent a statistical probability that an adverse health effect will occur.

7.3.1 HHRA-PH Conclusions

The HHRA-PH evaluated cumulative risks for exposure to surface water, sediment, and field-collected fish and crab tissue. The HHRA-PH evaluatedthe potential exposure people would experience under the current conditions of the Coke Point Offshore Area. The HHRA-PH evaluated the Coke Point Offshore Area for an expected low frequency of use as a recreational area.Results for the HHRA-PH reveal cumulative carcinogenic risk results that are above the USEPA carcinogenic target levels for all receptors, except the child recreational user. Non-carcinogenic hazards exceeded USEPA target levels for only the child recreational user.Dermal exposure to surface water was the primary contributor to cumulative carcinogenic risk results. Consumption of crab and fish also contributed to excess carcinogenic risk results. The carcinogenic results for the consumption of crab and fish were comparable to the results for the Patapsco River Background Area. However, the chemicals that contributed significantly to risk results differed according to the area evaluated. PAHs were the primary contributor to fish tissue in the Coke Point Offshore Area. Total PCBs were the primary contributors to consumption of crab tissue risks for both the Coke Point Offshore Area and the Patapsco River Background Area. It is noted that MDE hasa fish advisory in place for the Patapsco River (including the offshore area of the Coke Point Peninsula) to account for PCBs (MDE 2007). The analysis of uncertainties for the HHRA-PH indicated that the risk due to dermal exposure to surface water was over-estimated due to assumptions inherent in the dermal exposure model (USEPA 2004). Non-carcinogenic hazards are primarily from the consumption of crab tissue. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in surface water were the primary contributors to overall cumulative risks. Dioxins were the primary contributor to non-carcinogenic hazards. It is noted that the risk results for dioxin were based upon exposure

modeled using a BAF from the scientific literature and were not a result of field-collected tissue samples.

Risk Assessment for Public Health Impacts
Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$3.4x10^{-7}$	$1.1x10^{-4}$	$8.8x10^{-5}$	$2.9x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.4x10^{-6}$	$1.3x10^{-4}$	$3.7x10^{-5}$	$1.1x10^{-5}$	$1.8x10^{-4}$
Child Recreational User	$7.3x10^{-7}$	$4.9x10^{-5}$	$1.4x10^{-5}$	$4.2x10^{-6}$	$6.8x10^{-5}$
Watermen	$9.6x10^{-6}$	$2.4x10^{-4}$	$1.1x10^{-4}$	$3.6x10^{-5}$	$4.0x10^{-4}$
Patapsco River Background Area					
Adult Recreational User	$2.9x10^{-8}$	$7.1x10^{-6}$	$5.0x10^{-5}$	$4.1x10^{-5}$	$9.8x10^{-5}$
Adolescent Recreational User	$9.9x10^{-8}$	$8.2x10^{-6}$	$1.9x10^{-5}$	$1.6x10^{-5}$	$4.3x10^{-5}$
Child Recreational User	$5.0x10^{-8}$	$3.0x10^{-6}$	$7.2x10^{-6}$	$5.9x10^{-6}$	$1.6x10^{-5}$
Watermen	$8.0x10^{-7}$	$1.5x10^{-5}$	$6.1x10^{-5}$	$5.0x10^{-5}$	$1.3x10^{-4}$

Risk Assessment for Public Health Impacts
Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Crabs	Ingestion of Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.0008	0.0005	1.1	0.1	1.2
Adolescent Recreational User	0.004	0.0006	1.3	0.2	1.4
Child Recreational User	0.006	0.0007	1.6	0.2	1.8
Watermen	0.02	0.0009	1.4	0.2	1.5
Patapsco River Background Area					
Adult Recreational User	0.00009	0.0002	0.4	0.2	0.6
Adolescent Recreational User	0.0004	0.0002	0.4	0.2	0.6
Child Recreational User	0.0007	0.0002	0.5	0.3	0.8
Watermen	0.003	0.0003	0.5	0.2	0.7

7.3.2 HHRA-SC Conclusions

The HHRA-SC evaluated cumulative risks for exposure to surface water, sediment, and BAF modeled fish and crab tissue. Fish and crab tissue were modeled from laboratory bioaccumulation tests of Coke Point sediment. These laboratory bioaccumulation tests provided a link between chemical concentrations in sediment and chemical concentrations taken up into tissue. The uptake into tissue is not influenced by the mobility of organisms or variations in field conditions. The HHRA-SC evaluated a theoretical maximum exposure that provides a conservative indication of potential contribution to risk from offshore sediment and surface water. Results for the HHRA-SC revealedcumulative carcinogenic risk results that were above

the USEPA carcinogenic target levels for all receptors. Non-carcinogenic hazards also exceeded USEPA target levels for all receptors evaluated. For all receptors, the consumption of modeled crab and fish tissue and dermal exposure to surface water were the primary pathway contributing to carcinogenic and non-carcinogenic risks. As in the HHRA-PH, it is noted that the predicted risks associated with dermal surface water contact were likely over-estimated. For carcinogenic risks, PAHs, specifically benzo(a)pyrene and dibenz(a,h)anthracene, in modeled fish and crab tissue, surface water, and total PCBs in modeled crab tissue were significant contributors. Dioxin and naphthalene were the primary contributor to non-carcinogenic hazards.

Risk Assessment for Source Characterization and Site Planning
Summary of Carcinogenic Risk Results

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	$2.7x10^{-6}$	$9.2x10^{-4}$	$1.0x10^{-3}$	$6.1x10^{-4}$	$2.6x10^{-3}$
Adolescent Recreational User	$1.2x10^{-5}$	$1.1x10^{-3}$	$9.7x10^{-4}$	$7.0x10^{-4}$	$2.7x10^{-3}$
Child Recreational User	$5.9x10^{-6}$	$3.9x10^{-4}$	$3.6x10^{-4}$	$2.6x10^{-4}$	$1.0x10^{-3}$
Watermen	$9.6x10^{-6}$	$4.9x10^{-4}$	$1.3x10^{-3}$	$7.4x10^{-4}$	$2.5x10^{-3}$
Patapsco River Background Area					
Adult Recreational User	$3.0x10^{-7}$	$5.8x10^{-5}$	$1.3x10^{-4}$	$4.0x10^{-5}$	$2.3x10^{-4}$
Adolescent Recreational User	$1.1x10^{-6}$	$6.7x10^{-5}$	$9.7x10^{-5}$	$4.5x10^{-5}$	$2.1x10^{-4}$
Child Recreational User	$5.7x10^{-7}$	$2.5x10^{-5}$	$3.6x10^{-5}$	$1.7x10^{-5}$	$7.9x10^{-5}$
Watermen	$1.1x10^{-6}$	$1.5x10^{-5}$	$1.6x10^{-4}$	$4.8x10^{-5}$	$2.2x10^{-4}$

Risk Assessment for Source Characterization and Site Planning
Summary of Non-Carcinogenic Hazard Indices

Receptor of Concern	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Non-Carcinogenic Risk
Coke Point Offshore Area					
Adult Recreational User	0.01	0.006	1.7	0.3	2.0
Adolescent Recreational User	0.04	0.006	1.9	0.4	2.4
Child Recreational User	0.07	0.008	2.4	0.5	3.0
Watermen	0.03	0.005	2.0	0.4	2.5
Patapsco River Background Area					
Adult Recreational User	0.003	0.003	0.6	0.3	0.9
Adolescent Recreational User	0.02	0.004	0.7	0.3	1.0
Child Recreational User	0.03	0.004	0.8	0.4	1.3
Watermen	0.01	0.003	0.7	0.4	1.1

The results of the HHRAs indicate that calculated risks for potential human exposure to the Coke Point Offshore Area are above those for the Patapsco River Background Area.

7.3.3 Media-Specific Conclusions

Surface Water

A primary contributor to cumulative carcinogenic risks in both the HHRA-PH and HHRA-SC was the dermal contact with surface water exposure pathway. The risk results for this pathway present a number of uncertainties that need to be taken into account in risk management decisions. PAHs were the only class of chemicals that contributed to the carcinogenic risks determined for the surface water exposure pathway. The USEPA dermal guidance (USEPA 2004) notes that the permeability coefficients (PCs) estimated for PAHs are outside of a predictive range and cannot be verified. As a result, the actual absorbed dose of PAHs through the skin was most likely over-estimated. Additionally, the surface water exposure pathway also estimated potential risks for exposure to the entire study area around the Coke Point Peninsula, including water within the turning basin and along the Coke Point shoreline. The use of the USEPA ProUCL program takes into account sample results over the entire exposure area to eliminate some uncertainty and determine the concentration contacted over the entire area, including samples with non-detects. However, actual PAH detections in surface water were spatially limited. **Figures 3.13** through **3.15**in the risk assessment present the detected PAH concentrations, as represented by benzo(a)pyrene. PAHs are highest in surface water locations immediately offshore of Coke Point Peninsula at locations BH-W-06 and BH-W-10B. These locations are not expected to attract recreational swimmers based on current site conditions. Furthermore, surface water PAH detections were not consistently detected throughout the study area which is a result of typical surface water movement and influences from other conditions, including groundwater discharge, tidal flow, etc. Due to these limitations, potential carcinogenic risks for dermal contact with surface water were likely over-estimated. The results of the HHRA should be used in context with the known groundwater contamination discharge to surface water to determine risk management decisions for potential human health concerns and potential project design. The Site Assessment (EA 2009b) noted that impacted groundwater fluxes from the northwestern and eastern parts of the Coke Point Peninsula to the adjacent Patapsco River and Turning Basin. This discharge of groundwater to surface water has negatively affected surface water quality (EA 2009b). Additionally, sediments along the Coke Point shoreline are impacted with residual NAPL and have the potential to be disturbed along the shoreline by wave action (EA 2009b). Both factors could potentiallycontributeto elevated concentrations of PAHs in surface water and act as a continual source.

Sediment

Overall risk results for exposure to sediment were within acceptable levels for both the Coke Point Offshore Area and the Patapsco River Background Area. However, risks for the Coke Point Offshore Area were greater than those for the Patapsco River Background Area. The highest concentrations of PAHs in surface sediment were found along the Coke Point shoreline, but the area of impacted sediments is not confined to one or two localized regions. Elevated concentrations of PAHs and metals were detected in surface sediments all around the Coke Point Peninsula. As noted in **Appendix H**, average concentrations of metals, PAHs, and PCBs were higher in clams exposed to Coke Point sediments compared to concentrations in clams exposed to control sediments and compared to clams prior to testing (pre-test tissues). The same trends

were apparent for aquatic worms. This is a strong indication that uptake from sediments into tissue occurs and that at least some portion of the chemicals in sediment is bioavailable to aquatic organisms. Therefore, chemicals within sediment along the Coke Point Offshore area are available for uptake and present a potential continual source of chemicals to fish and potentially humans.

Fish and Crab Tissue

The overall risk results for the consumption of field-collected fish and crab tissue, when evaluated as separate exposures, were acceptable per USEPA guidance. Carcinogenic and non-carcinogenic risk estimates for Coke Point crab consumption were higher than background, but still acceptable, though only marginally for certain receptors.Concentrations of chemicals in field-collected crab tissue from the Coke Point Offshore Area were statistically significantly higher than those in the background area for a number of chemicals, including metals and some PAHs (**Appendix H**). For field-collected fish tissue, fish filets from the Patapsco River Background Area contained higher overall concentrations of total PCB congeners, arsenic, and selenium than filets from the Coke Point Offshore Area.Bioaccumulation studies, **Appendix H**, provide evidence that chemicals from sediment are taken up into the aquatic food chain at concentrations higher than those in background. Therefore, chemicals within the Coke Point Offshore Area are available for uptake and present a potential continual source of chemicals to fish and potentially humans.

7.4 UNCERTAINTIES

Risk assessments involve a number of uncertaintiesthat must be taken into consideration when interpreting risk assessment results. The risk assessment for the Coke Point Offshore Area bears a number of uncertainties. The risk assessment was based on existing conditions, and did not evaluate hypothetical future scenarios that could arise should erosion or dredging expose deeper sediments with different exposure concentrations. Risk assessment methods as specified by guidance (USEPA 1997a, 2002) are precautionary; as such, they are protective but may over-estimate risks to assure protectiveness of public health and the environment. The chemical analytical data set used for the risk assessment was subject to limitations associated with environmental variability. In particular, surface water concentrations can be highly variable due to changing sources. There is also uncertainty associated with extrapolation from modeled effects to individuals to community level effects for ecological receptors. Use of site-specific tissue data to characterize bioaccumulation decreased the uncertainty of the risk assessment overall, but introduced some uncertainty associated with field-collection of fish and crabs (i.e., a single sampling event; a single fish species, etc.). Methods of mitigating uncertainty were incorporated into the risk assessment approach to the greatest extent possible. It is not possible to quantify the degree of uncertainty within the risk assessment. However, a relative comparison of the risk assessment results to reduced risksas a result of potential project design can be performed subsequent to this study.

7.5 CONCLUSIONS

The results of the risk assessment support the following conclusions:

- **Ecological Risks:** Specific chemicals in sediments of the Coke Point Offshore Area may pose risks to ecological receptors that are greater than the background risks posed in the Patapsco River Background Area.

    - Arsenic, chromium, copper, lead, mercury, zinc, LMW PAHs, HMW PAHs, dioxins, and total PCBs in surface sediment pose predicted risks to aquatic organisms such as clams, worms, and crustaceans. Several of the same chemicals were found in surface water and also contribute risks.

    - Total PCBs pose risks to wildlifesuch as birds and mammals that are higher than background for some prey types; LMW PAHs and HMW PAHs may pose risks for wildlife, but their potential for impacts is limited to those portions of the site with the highest concentrations.

    - Risks to wildlife are due to both incidental ingestion of sediment and ingestion of bottom-dwelling organisms such as clams and worms that have accumulated chemicals in their tissue. Highest risks to wildlife are driven by ingestion of sediment and benthic orgamisms (as opposed to surface water, crabs, and fish).

- **Human Health Risks:**Specific chemicals in sediments and surface water of the Coke Point Offshore Area pose potential risks to human receptors that are greater than the risks posed in the Patapsco River Background Area.

    - For both HHRAs, carcinogenic risks are primarily driven by total PCBs and the PAHs benzo(a)pyrene and dibenz(a,h)anthracene.

    - Both HHRAs predicted that a primary exposure pathway that contributes to risks above acceptable levels and greater than the Patapsco River Background is dermal exposure to surface water during swimming, commercial fishing, or other water activities. While the numeric estimate of this risk is probably over-estimated, the indicator that risk associated with the Coke Point Offshore Area is higher than the Patapsco River Background Area is relevant.

    - Both HHRAs predicted risk for surface sediment that is within levels generally considered acceptable, although risks are elevated at levels higher than the Patapsco River Background Area.

    - The HHRA-PH risk results for field-collected crab and fish tissue were comparable between the Coke Point Offshore Area and the Patapsco River Background Area. When evaluated as separate exposure pathways, risks were considered acceptable in accordance with USEPA guidance, although risks from crab consumption are at the upper limit of the risk range typically considered acceptable. Risks were attributable to total PCBs for both areas and PAHs for the Coke Point Offshore Area. It is noted that MDE has issued a fish advisory for the Patapsco River to account for total PCBs (MDE 2007).

- The HHRA-SC risk results reveal that long-term consumption of fish and crab, based upon results of laboratory bioaccumulation tests and uptake modeling, are above levels generally considered acceptable. Risk results for the Coke Point Offshore Area are also elevated above the Patapsco River Background Area.

- The HHRA-SC reveals that the Coke Point Offshore Area contributes risks through the local food chain due to uptake by aquatic organisms such as clams and worms. Basing exposures on tissue concentrations from lower trophic level organisms, such as clams and worms produced higher risks than basing exposures on concentrations from field-collected fish and crab which are higher on the food chain. However, chemical contributions from Coke Point were still evident in tissue concentrations from crabs and fish.

Future risk reduction efforts should focus on chemicals identified as primary risk drivers in surface sediment. Risk reduction efforts for these chemicals would also address elevated concentrations of other chemicals that also contribute to overall, cumulative risks and are co-located in the same area. The primary focus of the offshore risk reduction should target the highest concentrations of chemicals identified as primary risk drivers, located in surface sediments to the west and southeast of Coke Point. Subsurface sediment is not evaluated in the risk assessment. Exposure pathways for subsurface sediment are considered incomplete in this evaluation of current conditions. As a result, potential future risk as a result of erosion or dredging has not been considered in the risk assessment. Risk reduction efforts should take into account subsurface sediments if current conditions within the Coke Point Offshore Area are expected to change; additional evaluation of subsurface sediment may be required as part of the MPA's site planning for a DMCF.

7.6 RECOMMENDATIONS

A recommendation of the risk assessment is that the MPA project team incorporates the finding of potential risks from sediment into DMCF project planning, as this may be relevant to how the DMCF and associated features may be designed. It is therefore recommended that risk reduction be considered as means for informing potential project design. The risk assessment provides models and tools that could be used to formulate design options and predict their effective risk reduction.To address these recommendations, MPA should complete a risk management study to evaluate the extent to which offshore and onshore remedial measures implemented in conjunction with proposed DMCF would lead to overall risk reduction. Information from the risk assessment and risk management study will assist MPA in determining whether a DMCF at Coke Point could be part of a clean-up effort for the site.

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8. REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. *Public Health Assessment, Callahan Mining Corporation, Brooksville (Cape Rosier), Hancock County, Maine*. April.

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Arsenic. Department of Health and Human Services. Atlanta. September.

Agency for Toxic Substances and Disease Registry (ATSDR). 2009. *Minimal Risk Levels*. December.Bayer, R.D. 1978. Aspects of an Oregon estuarine great blue heron population. In: Sprunt, A., J. Ogden, and S. Winckler, eds. Wading Birds. National Audubon Society Research Report 7; pp. 213-217.

Bechtel Jacobs Company LLC (Bechtel). 1998. *Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation*. Prepared for U.S. Department of Energy. August 1998.

Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1. Seattle, WA. Coastal Protection and Restoration Division.National Oceanic and Atmospheric Administration. 12pp.

Burkhard, Lawrence P., Philip M. Cook, and Marta T. Lukasewycz. 2004. Biota-Sediment Accumulation Factors for polycholorinated biphenyls, dibenzo-p-dioxins, and dibenzofurans in southern Lake Michigan lake trout (*Salvelinusnamaycush*). *Environmental Science and Technology* 38: 5297-5305.

California Environmental Protection Agency (CalEPA). 2010. *Toxicity Criteria Database*. Database maintained on the Internet: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp. California EPA Office of Environmental Health Hazard Assessment.

CH2MHill. 2001. *Site-Wide Investigation: Groundwater Study Report, Bethlehem Steel Corporation, Sparrows Point Division*. Prepared by CH2M-Hill, Herndon Virginia for Bethlehem Steel Corporation, Sparrows Point Division, Maryland. December.

CH2MHill. 2002. *Site-Wide Investigation Release Site Characterization Study*. Prepared by CH2M-Hill, Herndon Virginia for Bethlehem Steel Corporation, Sparrows Point Division, Maryland. June.

Computer Sciences Corporation. 2008. Biota-Sediment Accumulation Factor Data Set, Version 1.0. Prepared for USEPA.

Di Toro D.M., J.A. McGrath, and D.J. Hansen. 2000. Technical basis for narcotic chemicals and polycyclic aromatic hydrocarbon criteria. *Environ. Toxicol. Chem.* 19:1951–1970.

Donohue, Joyce Morrissey and Abernathy, Charles O. 1999.*Exposure to Inorganic Arsenic from Fish and Shellfish*.Arsenic Exposure and Health Effects, Volume 3. Elsevier Science, Ltd. Kidlington, Oxford.

EA Engineering, Science, and Technology, Inc. (EA). 2003. *Reconnaissance Study of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions*. Final.December.

EA Engineering, Science, and Technology, Inc. (EA). 2004. *Feasibility Studies of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions.*

EA Engineering, Science, and Technology, Inc. (EA). 2007. *FY05 Evaluation of Dredged Material: Baltimore Harbor Federal Navigation Channels*. Prepared for U.S. Army Corps of Engineers – Baltimore District.November.

EA Engineering, Science, and Technology, Inc. (EA). 2009a. *Coke Point Dredged Material Containment Facility Pre-Pilot Study Sediment Characterization*. Draft.December.

EA Engineering, Science, and Technology, Inc. (EA). 2009b. *Site Assessment for the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point*. Final.November.

EA Engineering, Science, and Technology, Inc. (EA). 2009c. *FY 08 Evaluation of Dredged Material: Baltimore Harbor Federal Navigation Channels, Patapsco River, Maryland*. Final.July.

EA Engineering, Science, and Technology, Inc. (EA). 2010a. *Work Plan Addendum, Additional RCRA Facilities Investigation, Sparrows Point Peninsula, Offshore Area, Baltimore, Maryland*. February.

EA Engineering, Science, and Technology, Inc. (EA). 2010b. *Work Plan for Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point*. May.

EA Engineering, Science, and Technology, Inc. (EA). 2010c. *Additional Offshore Delineation: Proposed Coke Point Dredged Material Containment Facility at Sparrows Point.* Baltimore County, Maryland. August.

EA Engineering, Science, and Technology, Inc. (EA). 2011. Laboratory Bioaccumulation And Field-Collected Tissue Study In Support Of The Risk Assessment Of The Offshore Areas Adjacent To The Proposed Coke Point Dredged Material Containment Facility At Sparrows Point. January.

Federal Energy Regulatory Commission (FERC). 2008. *Final Environmental Impact Statement, Sparrows Point LNG Terminal and Pipeline Project*. Federal Energy Regulatory Commission, Office of Energy Projects.December.

GBA. 2005. Bathymetric Survey. Completed for Maryland Port Administration.

Gibbs, J.P. (1991) Spatial relationships between nesting colonies and foraging areas of great blue herons. *Auk* 108: 764-770.

Gibbs, J P.,S. Woodward, M.L. Hunter, et al. 1987. Determinants of great blue heron colony distribution in coastal Maine. *Auk* 104: 38-47.

International Steel Group (ISG). 2005. *Documentation of Environmental Indicator Determination, RCRA Corrective Action*.

Jones, D.S., G.W. Suter II, and R.N. Hull. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision*. ES/ER/TM-95/R4.Prepared for U.S. Department of Energy, Office of Environmental Management.Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Long, E.R., and L.G. Morgan. 1990. *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program*. National Oceanic and Atmospheric Administration, National Ocean Service, Seattle, Washington.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management* 19(1):81-97.

Lorenzana, R.M., et al. *Arsenic in Seafood: Speciation Issues for Human Health Risk Assessment*. Human and Ecological Risk Assessment: An International Journal, Volume 15, Issue 1, January 2009, Pages 185-200.

MacDonald, D.D., R.S. Carr, F.D. Calder, E.R. Long, and C.G. Ingersoll. 1996. Development and evaluation of sediment quality guidelines for Florida coastal waters. *Ecotoxicology* 5:253-278.

Maryland Department of the Environment (MDE). 1997. *Risk Based Screening of Metals in Maryland Finfish Tissue, 1985-1997*. Technical and Regulatory Services Administration.

Maryland Department of the Environment (MDE). 2007. *Fish Advisory Table, Recommended Maximum Meals Each Year for Maryland Waters*. Updated April 13, 2011 for Striped Bass and Bluefish.

Maryland Department of the Environment (MDE). 2008. *Cleanup Standards for Soil and Groundwater*. Interim Final Guidance. June.

Norin, Harald, et al. *Concentration of inorganic and total arsenic in fish from industrially polluted water*. Chemosphere, Volume 14, Issues 3-4, 1985, Pages 325-334.

Oak Ridge National Laboratory. 2009. *Risk Assessment Information System, Toxicity and Physical Properties – Chemicals*. Online Database (http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem).Accessed February 2009.

Office of Environmental Health Hazard Assessment (OEHHA) California. 2000. Technical Support Document for Exposure Assessment and Stochastic Analysis. Appendix H: Fish Bioconcentration Factors.September.

Ontario Ministry of the Environment and Energy (OMEE). 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Water Resources Branch.August.

Peifer, R.W. 1979. Great blue herons foraging for small mammals. *Wilson Bull*. 91: 630-631.

Rust Environmental & Infrastructure (RE&I). 1998. *Description of Current Conditions, Bethlehem Steel Corporation, Sparrows Point, Maryland.*Harrisburg and Philadelphia Offices.January.

Salgado, S.G., et al. *Assessment of total arsenic and arsenic species stability in alga samples and their aqueous extracts*. Atlanta, Volume 75, Issue 75, 30 May 2008, Pages 897-903.

Sample, B.E., D.M. Opresko, and G.W. Suter. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*. ES/ER/TM-86/R3. Risk Assessment Program, Health Sciences Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Schaeffer, Richard et al. *Arsenic speciation in freshwater organisms from the river Danube in Hungary*.Atalanta, Volume 69, Issue 4, 15 June 2006, Pages 856-865.

Suter II, G.W., and C.L. Tsao. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*. ES/ER/TM-96/R2. Risk Assessment Program, Health Sciences Research Division, Oak Ridge National Laboratory.

Suthersan, S.S. 1997. *Remediation Engineering: Design Concepts*. Boca Raton, FL: Lewis Publishers, CRC Press Inc. 362 pp.

URS Corporation (URS). 2005a. *Site Wide Investigation, Report of Nature and Extent of Releases to Groundwater from the Special Study Areas, International Steel Group, ISG Sparrows Point, Inc. Facility, Sparrows Point, Maryland*. Prepared by URS, Cleveland Ohio.January.

URS Corporation (URS). 2005b. CA725 Facility Investigation and Human Health Risk Evaluation (HHRE) Findings, ISG Sparrows Point. Presentation to Maryland Department of Environment and U.S. Environmental Protection Agency, Region III, June 9, 2005. 39 pp.

URS Corporation (URS). 2006. Response to EPA Comments (4) and (5) dated December 15, 2005. Prepared by URS, under contract to ISG Sparrows Point LLC. Attachment to letter by Robert Abate, ISG Sparrows Point LLC to Andrew Fan, U.S. Environmental Protection Agency, Region III, and Richard Johnson, Maryland Department of Environment, December 6, 2006. 17 pp.

United States of America (USA) and State of Maryland MDE vs. Bethlehem Steel. 1997. Consent Decree. Ivil action No.JFM-97-558.Entered October 8, 1997 in U.S. District Court for the District of Maryland.

U.S. Department of Energy (USDOE). 2010. *Risk Assessment Information System* Toxicity and Chemical-Specific Factors Database maintained on the Internet: http://rais.ornl.gov/.

U.S. Environmental Protection Agency (USEPA). 1980. *Ambient Aquatic Life Water Quality Criteria for Antimony*. U.S. Environmental Protection Agency Office of Research and Development Environmental Research Laboratories.October.

U.S. Environmental Protection Agency (USEPA). 1985a. *Ambient Aquatic Life Water Quality Criteria for Arsenic 1984* . USEPA Office of Research and Development Environmental Research Laboratories.January.

U.S. Environmental Protection Agency (USEPA). 1985b. *Ambient Aquatic Life Water Quality Criteria for Lead – 1984*. USEPA Office of Research and Development Environmental Research Laboratories.January.

U.S. Environmental Protection Agency (USEPA). 1985c. *Ambient Aquatic Life Water Quality Criteria for Mercury 1984* . USEPA Office of Research and Development Environmental Research Laboratories.January.

U.S. Environmental Protection Agency (USEPA). 1986. *Ambient Aquatic Life Water Quality Criteria for Nickel – 1986*. USEPA Office of Research and Development Environmental Research Laboratories.September.

U.S. Environmental Protection Agency (USEPA). 1987a. *Ambient Aquatic Life Water Quality Criteria for Selenium 1987* . USEPA Office of Research and Development Environmental Research Laboratories.September.

U.S. Environmental Protection Agency (USEPA). 1987b. *Ambient Aquatic Life Water Quality Criteria for Zinc – 1987*. USEPA Office of Research and Development Environmental Research Laboratories.February.

U.S. Environmental Protection Agency (USEPA). 1989. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A).*Interim Final.EPA/540/1-89/002.U.S. Environmental Protection Agency (USEPA), Office of Emergency and Remedial Response, Washington, D.C. December.

U.S. Environmental Protection Agency (USEPA). 1990. *National Oil and Hazardous Substances Pollution Contingency Plan* (40 CFR Part 300).

U.S. Environmental Protection Agency (USEPA). 1991. *Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual: Supplemental Guidance –* "Standard Default Exposure Factors" (Interim Final). Publication 9285.7-01B.

U.S. Environmental Protection Agency (USEPA). 1992. *Guidelines for Data Usability in Risk Assessment (Part A)*. Office of Solid Waste and Emergency Response, Publication OSWER9285.7-09A.

U.S. Environmental Protection Agency (USEPA). 1993. *Wildlife Exposure Factors Handbook*. 2 Vols.EPA/630/R-93/187a.USEPA Office of Research and Development, Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 1996. Ecotox Thresholds. *Eco Update* 3(2):1-12. EPA 540/F-95/038.USEPA Office of Solid Waste and Emergency Response.January.U.S. Environmental Protection Agency (USEPA). 1997a. *Ecological Risk Assessment Guidance for Superfund. Process for Designing and Conducting Ecological Risk Assessments*.Interim Final. USEPA, Environmental Response Team Office of Emergency and Remedial Response. Edison, New Jersey.

U.S. Environmental Protection Agency (USEPA).1997b. *Exposure Factors Handbook: Volumes I, II, and III*. EPA/600/P-95/002a,b,c. August.

U.S. Environmental Protection Agency (USEPA).1997c *Health Effects Assessment Summary Tables (HEAST).* Office of Emergency and Remedial Response.PB97-921199INX.July.

U.S. Environmental Protection Agency Region 3 (USEPA). 1999a. *Documentation of Environmental Indicator Determination, ISG Sp arrows Point.* RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725). Interim Final 2/5/99.

U.S. Environmental Protection Agency (USEPA). 1999b. *National Recommended Water Quality Criteria − Correction.* EPA 822-Z-99-001.USEPA Office of Water, Washington D.C.

U.S. Environmental Protection Agency (USEPA). 1999c. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*. USEPA OSW. Peer review draft.

U.S Environmental Protection Agency (USEPA). 2000. *Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment – Status and Needs*. EPA/823/R-00/001. USEPA Office of Water, Office of Solid Waste, Washington D.C.

U.S. Environmental Protection Agency (USEPA). 2002. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments).* Final.Office of Emergency and Remedial Response, Washington, DC.Publication 9285.7-47.December.

U.S. Environmental Protection Agency (USEPA). 2003a. *Guidance for Developing Ecological Soil Screening Levels*. USEPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-55.

U.S. Environmental Protection Agency (USEPA). 2003b. Region 3, Updated Dermal Exposure Assessment Guidance. Region 3 Technical Guidance Manual, Risk Assessment. June. Available at: http://www.epa.gov/reg3hwmd/risk/human/info/dermalag.htm.

U.S. Environmental Protection Agency (USEPA). 2003c. Memorandum: Human Health Toxicity Values in Superfund Risk Assessments. Office of Solid Waste and Emergency Response, OSWER Directive 9285.7-53.

U.S. Environmental Protection Agency (USEPA). 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E: Supplemental Guidance for Dermal Risk Assessment).* Final.Office of Superfund Remediation and Technology Innovation.EPA-540-R-99-005.July.

U.S. Environmental Protection Agency (USEPA). 2005a. *Procedures for Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc).* USEPA Office of Research and Development.EPA-600-R-02-11.

U.S. Environmental Protection Agency (USEPA). 2005b. *Guidelines for Carcinogen Risk Assessment*. Risk Assessment Forum. EPA/630/P-03/001F.March.

U.S. Environmental Protection Agency (USEPA). 2005c. *Supplemental Guidance for Assessing Susceptibility From Early-Life Exposure to Carcinogens*. Risk Assessment Forum. EPA/630/R-03/003F.March.

U.S. Environmental Protection Agency (USEPA). 2005d. Ecological Soil Screening Levels for Antimony. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-61.

U.S. Environmental Protection Agency (USEPA). 2005e. Ecological Soil Screening Levels for Arsenic. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-62.

U.S. Environmental Protection Agency (USEPA). 2005f. Ecological Soil Screening Levels for Beryllium. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-64.

U.S. Environmental Protection Agency (USEPA). 2005g. Ecological Soil Screening Levels for Cadmium. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-65.

U.S. Environmental Protection Agency (USEPA). 2005h. Ecological Soil Screening Levels for Cobalt. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-67.

U.S. Environmental Protection Agency (USEPA). 2005i. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-70.

U.S. Environmental Protection Agency (USEPA). 2005j. Ecological Soil Screening Levels for Vanadium. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-75.

U.S. Environmental Protection Agency (USEPA). 2006. Ecological Soil Screening Levels for Silver. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-77.

U.S. Environmental Protection Agency (USEPA). 2007a. Ecological Soil Screening Levels for Copper. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-68.

U.S. Environmental Protection Agency (USEPA). 2007b. Ecological Soil Screening Levels for Manganese. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-71.

U.S. Environmental Protection Agency (USEPA). 2007c. Ecological Soil Screening Levels for Nickel. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-76.

U.S. Environmental Protection Agency (USEPA). 2007d. Ecological Soil Screening Levels for Selenium. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-72.

U.S. Environmental Protection Agency (USEPA). 2007e. Ecological Soil Screening Levels for Zinc. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-73.

U.S. Environmental Protection Agency (USEPA). 2007f. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-78.

U.S. Environmental Protection Agency (USEPA). 2008a. *Child-Specific Exposure Factors Handbook*. National Center for Environmental Assessment, Office of Research and Development, EPA/600/R-06/096F.September.

U.S. Environmental Protection Agency (USEPA). 2008b. Ecological Soil Screening Levels for Chromium. EPA Office of Solid Waste and Emergency Response (OSWER).OSWER Directive 9285.7-66.

U.S. Environmental Protection Agency (USEPA). 2009a. *National Recommended Water Quality Criteria*. USEPA Office of Science and Technology, Office of Water.

U.S. Environmental Protection Agency (USEPA). 2009b. *Regional Screening Level (RSL) Fish Table*. Region 3.December.

U.S. Environmental Protection Agency (USEPA). 2009c. *ProUCL Version 4.00.04*. Software developed by USEPA. Obtained online at http://www.epa.gov/nerlesd1/tsc/software.htm.Las Vegas Technical Support Center for Monitoring and Site Characterization.

U.S. Environmental Protection Agency Region 3 (USEPA).2009d. Region 3 GPRA Baseline RCRA Corrective Action Facility, International Steel Group (former Bethlehem Steel) – Sparrows Point, Current Progress at the Site. http://www.epa.gov/reg3wcmd/ca/md/pdf/mdd053945432.pdf

U.S. Environmental Protection Agency (USEPA) 2010a. Mid-Atlantic Risk Assessment: Ecological Risk Assessment Screening Values. Database maintained on the Internet: http://www.epa.gov/reg3hscd/risk/eco/index.htm. Website last updated March 2010.

U.S. Environmental Protection Agency (USEPA).2010b *Regional Screening Levels for Superfund*. December.

U.S. Environmental Protection Agency (USEPA). 2010c. IRIS (Integrated Risk Information System) database maintained on the Internet: http://www.epa.gov/iris. USEPA Environmental Criteria and Assessment Office, Cincinnati.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE). 1998. *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual (ITM).*EPA-823-B-98-004.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE).1991. Evaluation of Dredged Material Proposed for Ocean Disposal.EPA-503/8-91/001.“The Green Book.”

U.S. Environmental Protection Agency (USEPA) and Maryland Department of the Environment (MDE). 2011a. Personal communication with Ruth Prince, USEPA, and Mark Mank, MDE on May 5, 2011.

U.S. Environmental Protection Agency (USEPA). 2011b. Personal communication with Ruth Prince, USEPA on May 19, 2011.

U.S. Environmental Protection Agency (USEPA). 2002. Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup. Program." USEPA OSWER. Document 9285.6-07P.

U.S. Environmental Protection Agency (USEPA) Assessment and Remediation of Contaminated Sediments (ARCS). 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalellaazteca* and the midge *Chironomusriparius*. EPA 905/R96/008.Great Lakes National Program Office, Chicago, IL.

U.S. Geological Survey (USGS). 1985. USGS National Wetlands Research Center: Habitat Suitability Index Models Species Index. Online at http:\\www.nwrc.usgs.gov\wdb\pub\his\hsiindex.htm.

Van Daele, L. J.; Van Daele, H. A. (1982) Factors affecting the productivity of ospreys nesting in west-central Idaho. Condor 84: 292-299.

Van den Berg, M., L. Birnbaum, A. T. C. Bosveld, B. Brunstrom, P. Cook, M. Feeley, J. P. Giesy, A. Hanberg, R. Hasegawa, S. W. Kennedy, T. Kubiak, J. C. Larsen, F. X. R. van Leeuwen, A. K. D. Liem, C. Nolt, R. E. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, M. Younes, F. Waern, T. Zacharewski. 1998. Toxic equivalency factors for PCBs, PCDDs, PCDFs for Humans and Wildlife. *Environmental Health Perspectives.* 106:775-792.

Van den Berg, M., L. Birnbaum, M. Denison, M. De Vito, M., W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, R. E. Peterson. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicological Sciences*. 93 (2) 223-241.

Weidou, A. 1981. Distribution and Binding of Cadmium in the Blue Crab, Implication in Human Health. Doctoral dissertation, New York University.Institute of Environmental Medicine.

Wisconsin Department of Environmental Protection. 2003. *Consensus-Based Sediment Quality Guidelines: Recommendations for Use & Application*. Interim Guidance. Document WT-732 2003.

FIGURES

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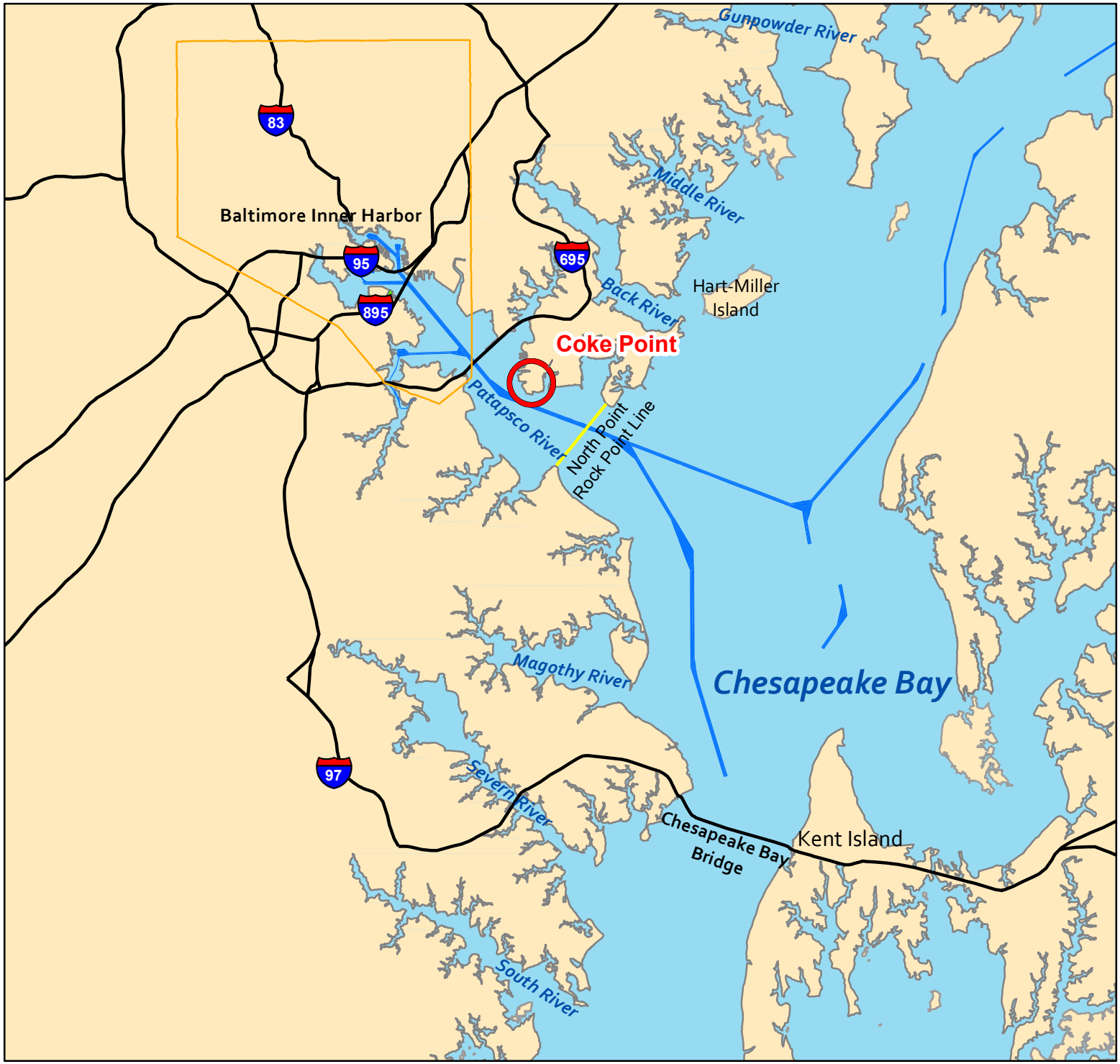

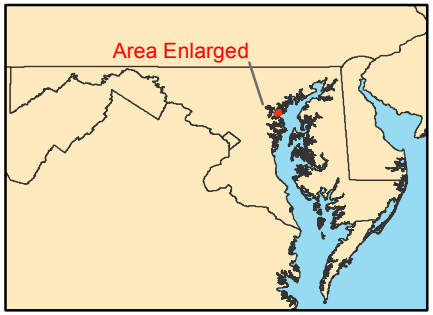

Legend

- Federal Navigation Channels
- Roads
- Baltimore City

Miles

0 4 8

Figure 1.1
Coke Point Location

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Legend

Areas of Concern

Feet

0 750 1,500

Figure 1.2
Coke Point
Areas of Concern

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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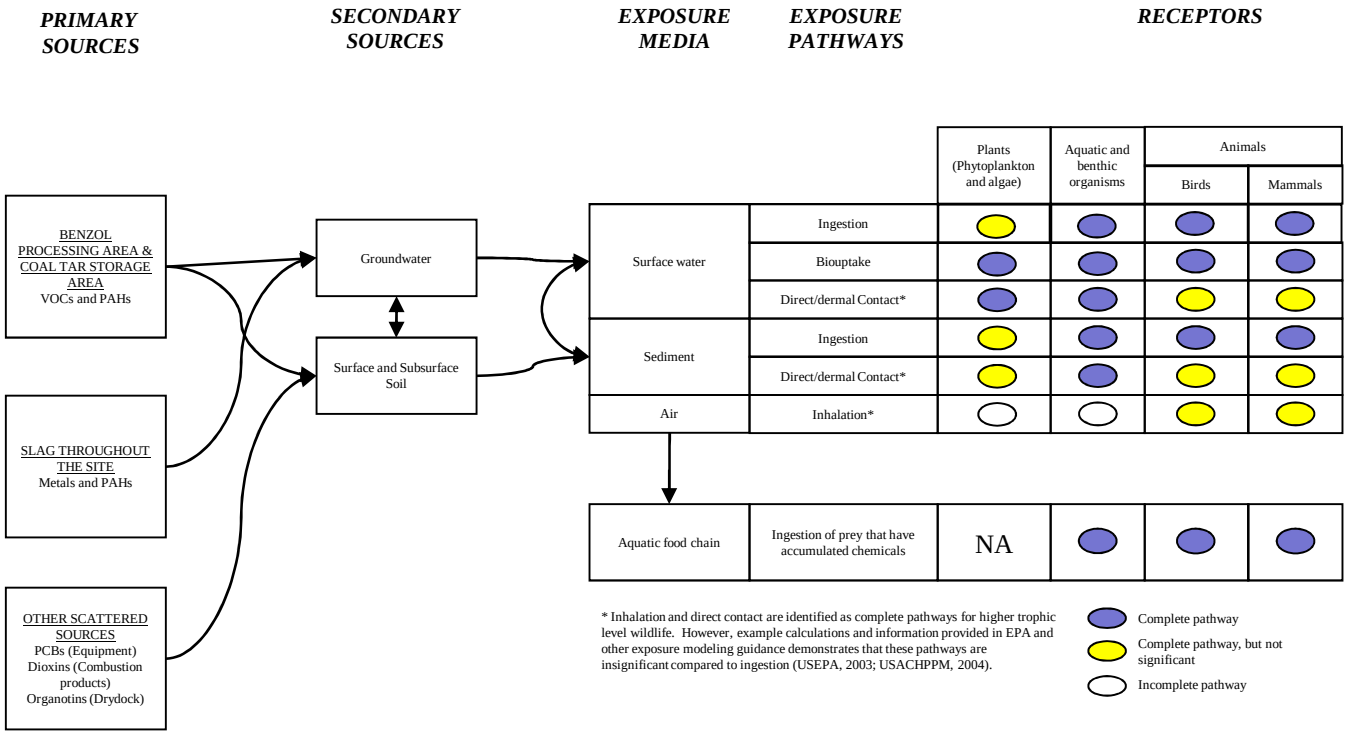

Figure 2.1. Ecological Components of the Conceptual Site Model for Coke Point Offshore Area, Sparrows Point

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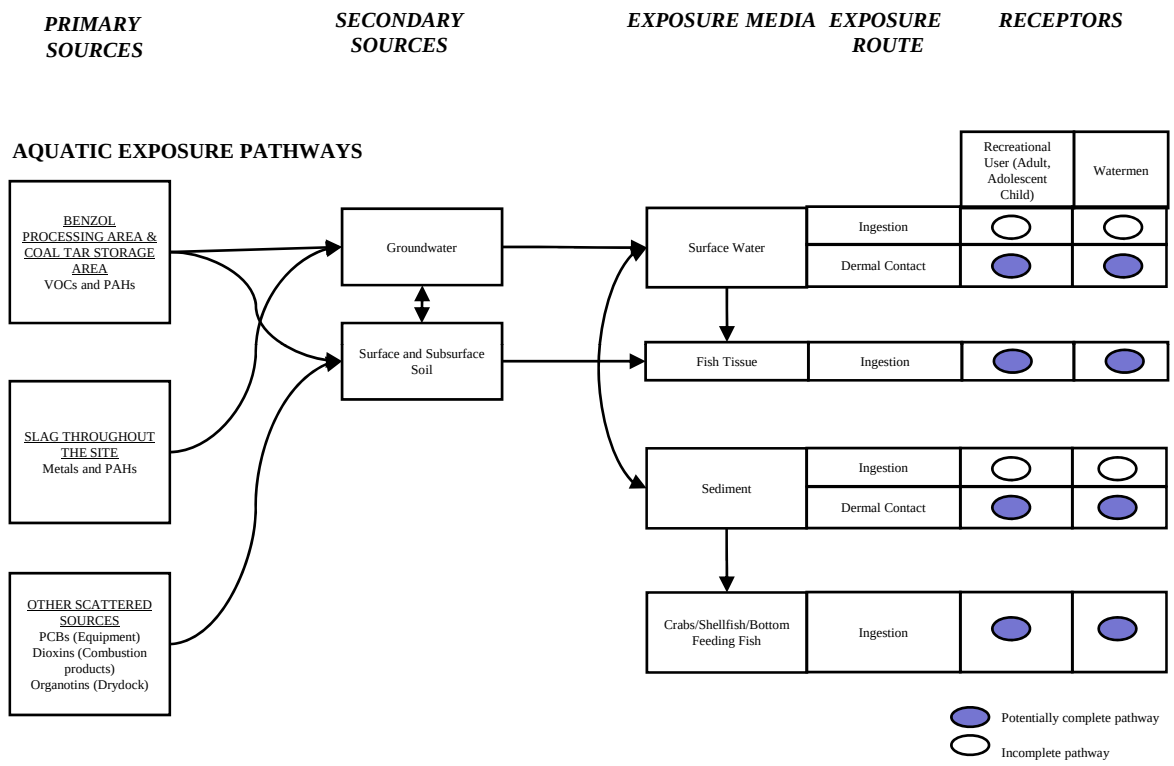

Figure 2.2. Human Health Components of the Conceptual Site Model for Coke Point Offshore Environments, Sparrows Point

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Sediment Samples

Area

- Coke Point Offshore Area
- Patapsco River Background
- Channel
- Other Far Field

Feet

0 2,000 4,000

Figure 3.1
Sediment Sampling Locations

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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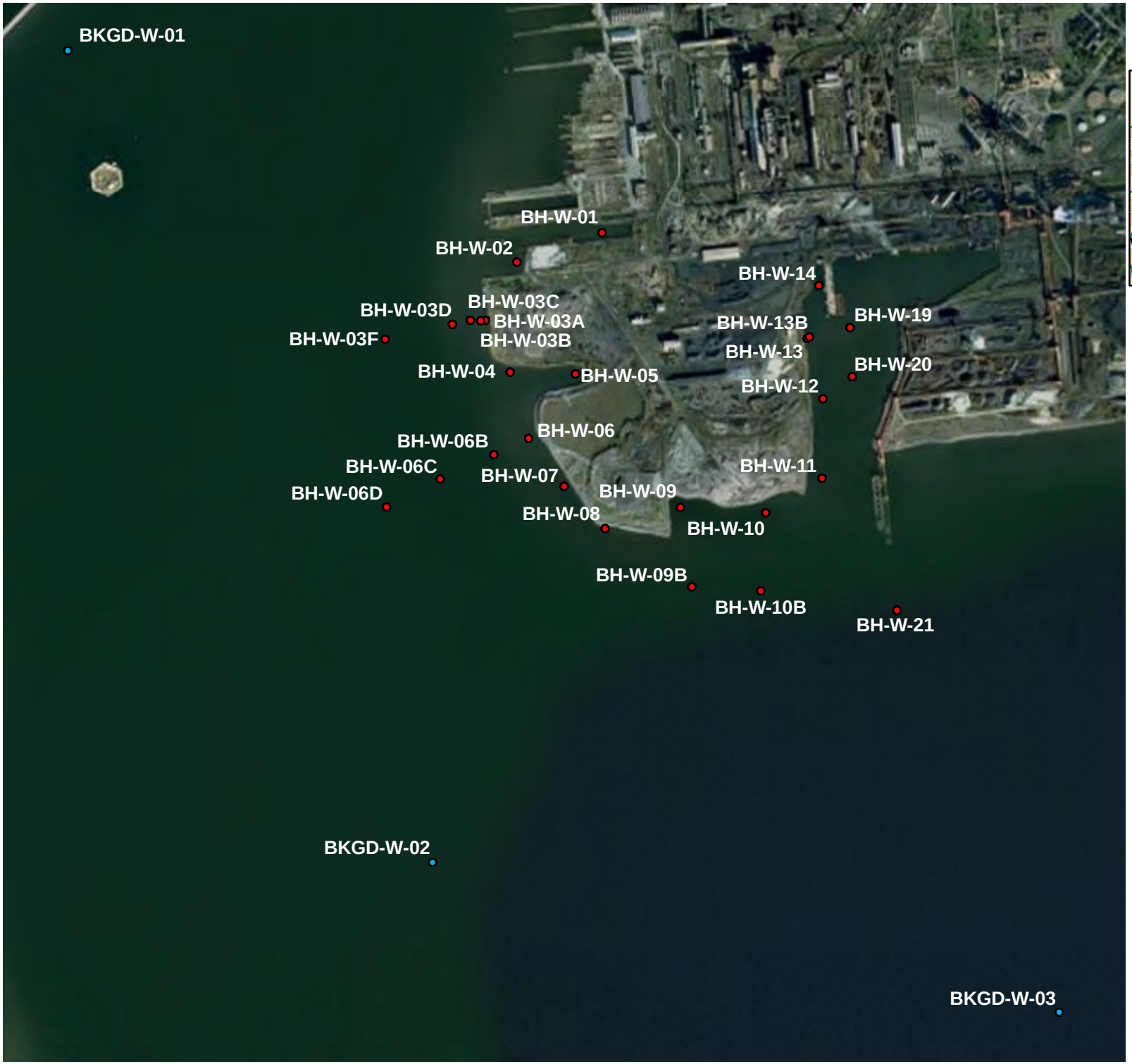

Legend

Water Samples

Area

- Coke Point Offshore Area
- Patapsco River Background

Feet
0 1,500 3,000

Figure 3.2
Water Sampling Locations

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Arsenic Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 3.74 (within background)
- 3.75 - 20
- 20.1 - 26.2
- 26.3 - 34.1
- 34.2 - 52.2
- 52.3 - 72

Feet

0 1,000 2,000

Figure 3.3
Arsenic Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Chromium Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 31.6 (within background)
- 31.7 - 241
- 241.01 - 262
- 262.01 - 296
- 296.01 - 391
- 391.01 - 504

Feet

0 1,000 2,000

Figure 3.4
Chromium Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Lead Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 13.6 (within background)
- 13.7 - 175
- 175.01 - 268
- 268.01 - 373
- 373.01 - 602
- 602.01 - 1280

Feet

0 1,000 2,000

Figure 3.5
Lead Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Zinc Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 61.8 (within background)
- 61.9 - 525
- 525.01 - 777
- 777.01 - 1160
- 1160.01 - 1790
- 1790.01 - 2730

N

Feet

0 1,000 2,000

Figure 3.6
Zinc Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Benzo(a)Pyrene Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 0.021 (within background)
- 0.022 - 1.15
- 1.16 - 3.6
- 3.61 - 8.8
- 8.81 - 20
- 20.01 - 27

Feet

0 1,000 2,000

Figure 3.7
Benzo(a)Pyrene Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Dibenzo(a,h)Anthracene Concentrations mg/kg

- Non-Detected (ND)
- 0.01 - 0.021 (within background)
- 0.022 - 0.37
- 0.38 - 0.65
- 0.66 - 1.5
- 1.51 - 2.6
- 2.61 - 6.3

Feet

0 1,000 2,000

Figure 3.8
Dibenzo(a,h)Anthracene Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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HMW-PAH Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 0.20 (within background)
- 0.21 - 17.64
- 17.65 - 40.16
- 40.17 - 104
- 104.01 - 143.9
- 144 - 288.3

N

Feet

0 1,000 2,000

Figure 3.9
High Molecular Weight Polycyclic Aromatic Hydrocarbon Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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LMW-PAH Concentrations

mg/kg

- Non-Detected (ND)
- 0.01 - 0.076 (within background)
- 0.077 - 20.18
- 20.19 - 79.66
- 79.67 - 142.3
- 142.31 - 242.3
- 242.31 - 7280.3

Feet

0 1,000 2,000

Figure 3.10
Low Molecular Weight Polycyclic Aromatic Hydrocarbon Concentration in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Total PCBs Concentrations

mg/kg

- Non-Detected (ND)
- 0.001 - 0.00815 (within background)
- 0.00816 - 0.069
- 0.070 - 0.131
- 0.132 - 0.189
- 0.190 - 0.292
- 0.293 - 0.487

Feet

0 1,000 2,000

Figure 3.11
Total PCB Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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WHO TEQ Concentrations

pg/kg

- Non-Detected (ND)
- 0.1 - 2.5 (within background)
- 2.6 - 12.6
- 12.7 - 14.9
- 15 - 21.2
- 21.3 - 42.2
- 42.3 - 77.7

Feet

0 1,000 2,000

Figure 3.12
WHO TEQ Dioxin Concentrations in Surface Sediment Grab Samples

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Benzo(a)pyrene Concentrations ug/L

Benzo(a)pyrene - Surface

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000051 (Below background)
- 0.000052 - 0.150000
- 0.150001 - 0.350000
- 0.350001 - 6.800000

Benzo(a)pyrene - Mid-Depth

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000051 (Below background)
- 0.000052 - 0.150000
- 0.150001 - 0.350000
- 0.350001 - 6.800000

Benzo(a)pyrene - Bottom

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000051 (Below background)
- 0.000052 - 0.150000
- 0.150001 - 0.350000
- 0.350001 - 6.800000

Note: Labels present concentrations at the water surface, mid-depth and bottom in decending order.

N

Feet

0 1,300 2,600

1'' = 1,300'

Figure 3.13
Benzo(a)pyrene Concentration in Surface Water Grab Samples at Three Depths

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Legend
HMW-PAH Concentrations ug/L

HMW PAH (ND=0) - Surface

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000718 (Below background)
- 0.000719 - 1.820000
- 1.820001 - 4.180000
- 4.180001 - 75.900000

HMW PAH (ND=0) - Mid-Depth

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000718 (Below background)
- 0.000719 - 1.820000
- 1.820001 - 4.180000
- 4.180001 - 75.900000

HMW PAH (ND=0) - Bottom

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000718 (Below background)
- 0.000719 - 1.820000
- 1.820001 - 4.180000
- 4.180001 - 75.900000

Note: Labels present concentrations at the water surface, mid-depth and bottom in decending order.

N

Feet
0 1,300 2,600
1'' = 1,300'

Figure 3.14
High Molecular Weight Polycyclic Aromatic Hydrocarbon Concentration in Surface Water Grab Samples at Three Depths

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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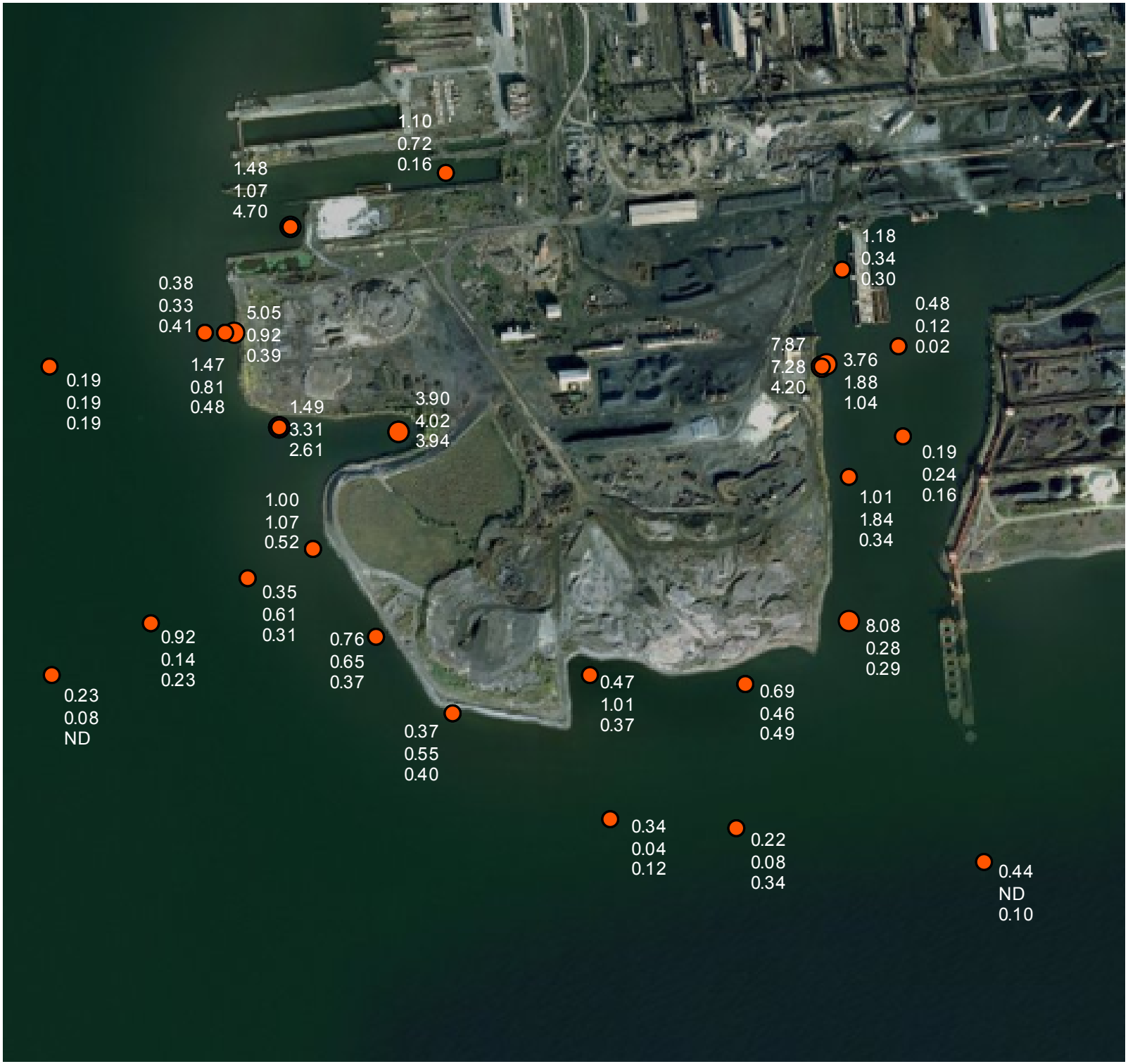

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LMW-PAH Concentrations ug/L

LMW PAH (ND=0) - Surface

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000789 (Below background)
- 0.000790 - 1.182000
- 1.182001 - 2.018000
- 2.018001 - 8.079000

LMW PAH (ND=0) - Mid-Depth

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000789 (Below background)
- 0.000790 - 1.182000
- 1.182001 - 2.018000
- 2.018001 - 8.079000

LMW PAH (ND=0) - Bottom

- 0.000000 Not Detected (ND)
- 0.000001 - 0.000789 (Below background)
- 0.000790 - 1.182000
- 1.182001 - 2.018000
- 2.018001 - 8.079000

Note: Labels present concentrations at the water surface, mid-depth and bottom in decending order.

N

Feet

0 1,300 2,600

1'' = 1,300'

Figure 3.15
Low Molecular Weight Polycyclic Aromatic Hydrocarbon Concentration in Surface Water Grab Samples at Three Depths

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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TABLES

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TABLE 2.1
THREATENED AND ENDANGERED SPECIES IDENTIFIED AS POTENTIALLY OCCURRING IN OR AROUND SPARROWS POINT

List	T/E	Scientific Name*	Common Name
Mammals			
Federal	**E**	***Balaenoptera borealis***	**Sei Whale**
Federal	**E**	***Balaenoptera physalus***	**Fin Whale**
Federal	**E**	***Eubalaena glacialis***	**North Atlantic Right Whale**
Federal	**E**	***Megaptera novaeangliae***	**Humpback Whale**
Federal	**E**	***Physeter macrocephalus***	**Sperm Whale**
Federal	T	*Myotis sodalis*	Indiana Bat
Fish			
Federal	**E**	***Acipenser brevirostrum***	**Shortnose Sturgeon**
State	**E**	***Acipenser oxyrinchus***	**Atlantic Sturgeon**
Federal	E	*Etheostoma sellare*	Maryland Darter
State	T	*Percina caprodes*	Logperch
Reptiles			
Federal	**T**	***Caretta caretta***	**Loggerhead Sea Turtle**
Federal	**T**	***Chelonia mydas***	**Green Sea Turtle**
Federal	**E**	***Dermochelys coricea***	**Leatherback Sea Turtle**
Federal	T	*Glyptemys muhlenbergii*	Bog Turtle
Federal	**E**	***Lepidochelys kempii***	**Kemp's Ridley Sea Turtle**
Birds			
State	**T**	***Haliaeetus leucocephalus***	**Bald Eagle**
State	**T**	***Sternula antillarum***	**Least tern**
Insects			
Federal	T	*Cicindela dorsalis dorsalis*	Northeastern Beach Tiger Beetle
State	E	*Speyeria idalia*	Regal Fritillary
Plants			
Dicotyledons			
State	E	*Agalinis setacea*	Thread-leaved foxglove
State	E	*Aster depauperatus*	Serpentine Aster
State	T	*Elephantopus carolinianus*	Elephant's Foot
State	T	*Ellisia nyctelea*	Ellisia
State	E	*Helianthemum bicknellii*	Hoary Frostweed
State	T	*Hydrastis canadensis*	Goldenseal
State	T	*Magnolia tripetala*	Umbrella Magnolia
State	E	*Polanisia dodecandra*	Clammyweed
State	T	*Polygala senega*	Seneca Snakeroot
State	T	*Sanguisorba canadensis*	Canada burnet
State	T	*Scutellaria leonardii*	Leonard's Skullcap
State	T	*Talinum teretifolium*	Fameflower
State	E	*Vernonia glauca*	Tawny ironweed
State	T	*Chrysopsis mariana*	Maryland Golden-Aster
Monocotyledons			
State	E	*Bromus latiglumis*	Broad-glumed Brome
State	E	*Carex hitchcockiana*	Hitchcock’s Sedge
State	E	*Carex hystericina*	Porcupine Sedge
State	E	*Deschampsia cespitosa*	Tufted Hairgrass
State	T	*Fimbristylis annua*	Annual Fimbry
State	T	*Scleria pauciflora*	Few-flowered Nutrush
State	E	*Sisyrinchium atlanticum*	Eastern Blue-eyed Grass
State	E	*Sporobolus heterolepis*	Northern Dropseed
State	T	*Stenanthium gramineum*	Featherbells

***** Names in **bold** indicate organisms that could potentially use mesohaline offshore aquatic habitats.
Source: Federal Energy Regulatory Commission (FERC). 2008. Final Environmental Impact Statement Sparrows Point LNG Terminal and Pipeline Project. Federal Energy Regulatory Commission, Office of Energy Projects. December 2008.
T= threatened, E=endangered

TABLE 3.1
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Field Effort	Number of Data Points						Notes	Location of Samples Included
	Metals	PAHs	VOCs	PCBs	Dioxins	Butyltins		
Coke Point Offshore Area Sediment								
RCRA Facility Investigation Sampling of Coke Point Offshore Area (2009)	18	18	18	0	0	0	Metals did not include Al,Co,Fe,Mn,Sb,Vn	Samples 1, 2, 3A/B/C, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13A/B/C, 14
Follow-up RCRA Facility Investigation Sampling of Coke Point Offshore Area (2010)	9	9	9	17	17	3	--	For Metals PCBs, PAHs, dioxins: 3F, 6B/C/D, 9B, 10B, 19, 20, 21 For PCB/Diox only: 1,2,3B/D, 4,6,10,11,13B For Butyltins also: 1, 2, 16
Reconnaissance Studies of Sparrows Point (2003)	4	4	0	4	4	4	Metals did not include Vn	SB-1 thru SB-4
Pre-Pilot Study of Sparrows Point (2009)	6	6	6	6	6	6	Metals did not include Vn	SP09-01 thr -06
Total Samples	**37**	**37**	**33**	**27**	**27**	**13**	--	--
Coke Point Offshore Area Surface Water								
RCRA Facility Investigation Sampling of Coke Point Offshore Area (2009)	--	54	54	--	--	--	Samples taken at 3 depths, surface, middle, and bottom of the water column	Samples 1, 2, 3A/B/C, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13A/B/C, 14
Follow-up RCRA Facility Investigation Sampling of Coke Point Offshore Area (2010)	51	42	42	--	--	--	Samples taken at 3 depths, surface, middle, and bottom of the water column	Samples 2, 3B/D/F, 4, 6, 6B/C/D, 9B, 10, 10B, 11, 13B, 19, 20, 21
Total Samples	**51**	**96**	**96**	**--**	**--**	**--**	--	--
Coke Point Offshore Area Tissue								
Field Studies (Crab Meat and Mustard Tissue)	10	10	--	10	--	--	Five composites of field collected organisms were made for each tissue type. Each composite was analyzed for metals, PAHs, and PCBs	CP-CASA-MT-A through -E and CP-CASA-MU-A through -E
Field Studies (Fish Fillet and Whole Body Tissue)	10	10	--	10	--	--		CP-MOAM-WB-A through -E and CP-MOAM-FT-A through -E
Lab Studies (Sediment composites with Worms and Clams)	5	5	--	5	--	--	Worms were exposed to five composites of field collected sediment.	AT0-649A through AT0-649E
	5	5	--	5	--	--	Clams were exposed to five composites of field collected sediment.	
Total Samples	**30**	**30**	--	**30**	--	--	--	--

TABLE 3.1
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Field Effort	Number of Data Points						Notes	Location of Samples Included
	Metals	PAHs	VOCs	PCBs	Dioxins	Butyltins		
Patapsco River Background Area Sediment								
RCRA Facility Investigation Sampling of Patapsco River Background Area (2010)	3	3	3	3	3	3	--	Samples BKGD-01, BKGD-02, BKGD-03
Feasibility Study of Sparrows Point (2004)	3	3	3	3	3	3	Metals did not include Al, Sb, Be, Co, Mn, Tl, Sn, Vn	Samples EH-2, EH-3, EH-4
Total Samples	**6**	**6**	**6**	**6**	**6**	**6**	--	--
Patapsco River Background Area Surface Water								
RCRA Facility Investigation Sampling of Patapsco River Background Area (2010)	9	9	9	--	--	--	Samples taken at 3 depths, surface, middle, and bottom of the water column	Samples BKGD-01, BKGD-02, BKGD-03
Total Samples	**9**	**9**	**9**	**--**	**--**	**--**	--	--
Patapsco River Background Area Tissue								
Field Studies (Crab Meat and Mustard Tissue)	10	10	--	10	--	--	Five composites of field collected organisms were made for each tissue type. Each composite was analyzed for metals, PAHs, and PCBs	PR-CASA-MT-A through -E and PR-CASA-MU-A through -E
Field Studies (Fish Fillet and Whole Body Tissue)	10	10	--	10	--	--		PR-MOAM-WB-A through -E and PR-MOAM-FT-A through -E
Lab Studies (Sediment composites with Worms and Clams)	5	5	--	5	--	--	Worms were exposed to five composites of field collected sediment.	AT0-650A through AT0-650E
	5	5	--	5	--	--	Clams were exposed to five composites of field collected sediment.	
Total Samples	**30**	**30**	--	**30**	--	--	--	--

TABLE 3.2
SUMMARY OF DATA INPUTS FOR ECOLOGICAL RISK ASSESSMENT SCENARIOS
COKE POINT OFFSHORE AND PATAPSCO RIVER BACKGROUND AREAS

Media of Concern	Aquatic Organism Exposures to Sediment and Surface Water	Wildlife Exposures for Birds and Mammals		
		Exposures via Ingestion of Sediment, Benthos, and Surface Water	Exposures via Ingestion of Sediment, Crab, and Surface Water	Exposures via Ingestion of Sediment, Fish, and Surface Water
Sediment	▪ Site-specific data used from field collected sediment samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected sediment samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected sediment samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected sediment samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately
Surface Water	▪ Site-specific data used from field collected surface water samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected surface water samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected surface water samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately	▪ Site-specific data used from field collected surface water samples ▪ Both Screening Level EPCs and Reasonable Maximum EPCs, evaluated separately
Prey Item Tissue	▪ Tissue EPCs were not used in quantitative evaluation for this receptor.	For metals, PAHs, and PCBs: ▪ Tissue concentrations modeled using site-specific sediment BAFs developed from sediment bioaccumulation tests using site sediment ▪ Both Screening Level EPCs and Reasonable Maximum EPCs in sediment, evaluated separately For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using sediment BAFs developed from the scientific literature ▪ Both Screening Level EPCs and Reasonable Maximum EPCs in sediment, evaluated separately	For metals, PAHs, and PCBs: ▪ Tissue concentrations statistically derived from field collected crab tissue data ▪ Meat and mustard concentrations were weighted and summed to estimate total edible crab concentrations ▪ Both Screening Level EPCs and Reasonable Maximum EPCs in tissue For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using sediment BAFs developed from the scientific literature ▪ Both Screening Level EPCs and Reasonable Maximum EPCs in sediment, evaluated separately	For metals, PAHs, and PCBs: ▪ Tissue concentrations statistically derived from field collected whole body tissue data ▪ Both Screening Level EPCs and Reasonable Maximum EPCs in tissue, evaluated separately For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using surface water BAFs developed from the scientific literature ▪ Based on Screening Level EPCs and Reasonable Maximum EPCs in surface water

PAHs = Polyaromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
BAFs = Bioaccumulation Factors
EPCs = Exposure Point Concentrations

TABLE 3.3
SUMMARY OF DATA INPUTS FOR HUMAN HEALTH RISK ASSESSMENT SCENARIOS
COKE POINT OFFSHORE AND PATAPSCO RIVER BACKGROUND AREAS

Media of Concern	Initial Comparison to Screening Levels	Scenario 1	Scenario 2
Sediment	▪ Site-specific data used from field collected sediment samples ▪ Based on Screening level EPCs	▪ Site-specific data used from field collected sediment samples ▪ Based on Reasonable Maximum EPCs	▪ Site-specific data used from field collected sediment samples ▪ Reasonable Maximum EPCs
Surface Water	▪ Site-specific data used from field collected surface water samples ▪ Based on Screening level EPCs	▪ Site-specific data used from field collected surface water samples ▪ Based on Reasonable Maximum EPCs	▪ Site-specific data used from field collected surface water samples ▪ Based on Reasonable Maximum EPCs
Crab	▪ Site-specific data used from field collected tissue samples ▪ Based on Reasonable Maximum EPCs	For metals, PAHs, and PCBs: ▪ Tissue concentrations modeled using site-specific sediment BAFs developed from sediment bioaccumulation tests using site sediment ▪ Based on Reasonable Maximum EPCs in sediment For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using sediment BAFs developed from the scientific literature ▪ Based on Reasonable Maximum EPCs in sediment	For metals, PAHs, and PCBs: ▪ Tissue concentrations statistically derived from field collected crab tissue data ▪ Meat and mustard concentrations were weighted and summed to estimate total edible crab concentrations ▪ Based on Reasonable Maximum EPCs in tissue For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using sediment BAFs developed from the scientific literature ▪ Based on Reasonable Maximum EPCs in sediment
Fish	▪ Site-specific data used from field collected tissue samples ▪ Based on Reasonable Maximum EPCs	For metals, PAHs, and PCBs, dioxins, inorganics, organotins, and VOCs ▪ Tissue concentrations modeled using surface water BAFs developed from the scientific literature ▪ Based on Reasonable Maximum EPCs in surface water	For metals, PAHs, and PCBs: ▪ Tissue concentrations statistically derived from field collected fish filet tissue data ▪ Based on Reasonable Maximum EPCs in tissue For dioxins, inorganics, organotins, VOCs: ▪ Tissue concentrations modeled using surface water BAFs developed from the scientific literature ▪ Based on Reasonable Maximum EPCs in surface water

PAHs = Polyaromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
BAFs = Bioaccumulation Factors
EPCs = Exposure Point Concentrations

TABLE 3.4

FREQUENCY OF DETECTION IN SEDIMENT AND EXPOSURE POINT CONCENTRATIONS (EPCS) FOR SEDIMENT AND AQUATIC ORGANISM TISSUE FOR THE COKE POINT OFFSHORE AREA GROUPING

Analyte	Toxicity Equivalency Factor[C]			Sediment (mg/kg dry wt.)			Crab Tissue (mg/kg wet wt.)[A]				Benthic Organism Tissue (mg/kg wet wt.)[B]		
	Fish	Bird	Mammal	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
DIOXINS													
1,2,3,4,6,7,8-HPCDD	0.001	0.001	0.01	27/27	2.30E-03	4.28E-04	NA	1.93E-06	3.60E-07	SedBAF	1.93E-06	3.60E-07	SedBAF
1,2,3,4,6,7,8-HPCDF	0.01	0.01	0.01	27/27	2.10E-04	6.42E-05	NA	5.65E-07	1.73E-07	SedBAF	5.65E-07	1.73E-07	SedBAF
1,2,3,4,7,8,9-HPCDF	0.01	0.01	0.01	25/27	2.00E-05	9.82E-06	NA	7.07E-08	3.47E-08	SedBAF	7.07E-08	3.47E-08	SedBAF
1,2,3,4,7,8-HXCDD	0.5	0.05	0.1	21/27	8.00E-06	3.11E-06	NA	9.15E-08	3.56E-08	SedBAF	9.15E-08	3.56E-08	SedBAF
1,2,3,4,7,8-HXCDF	0.1	0.1	0.1	27/27	3.60E-05	1.51E-05	NA	1.50E-06	6.29E-07	SedBAF	1.50E-06	6.29E-07	SedBAF
1,2,3,6,7,8-HXCDD	0.01	0.01	0.1	27/27	6.90E-05	2.15E-05	NA	3.61E-06	1.13E-06	SedBAF	3.61E-06	1.13E-06	SedBAF
1,2,3,6,7,8-HXCDF	0.1	0.1	0.1	26/27	1.30E-05	7.77E-06	NA	5.42E-07	3.24E-07	SedBAF	5.42E-07	3.24E-07	SedBAF
1,2,3,7,8,9-HXCDD	0.01	0.1	0.1	27/27	3.60E-05	1.21E-05	NA	1.76E-07	5.92E-08	SedBAF	1.76E-07	5.92E-08	SedBAF
1,2,3,7,8,9-HXCDF	0.1	0.1	0.1	6/27	1.40E-06	1.03E-06	NA	1.34E-07	9.83E-08	SedBAF	1.34E-07	9.83E-08	SedBAF
1,2,3,7,8-PECDD	1	1	1	18/27	1.10E-05	3.88E-06	NA	2.05E-06	7.21E-07	SedBAF	2.05E-06	7.21E-07	SedBAF
1,2,3,7,8-PECDF	0.05	0.1	0.03	27/27	1.30E-05	7.17E-06	NA	3.50E-08	1.93E-08	SedBAF	3.50E-08	1.93E-08	SedBAF
2,3,4,6,7,8-HXCDF	0.1	0.1	0.1	25/27	1.20E-05	5.82E-06	NA	5.01E-07	2.43E-07	SedBAF	5.01E-07	2.43E-07	SedBAF
2,3,4,7,8-PECDF	0.5	1	0.3	27/27	1.40E-05	7.77E-06	NA	2.57E-06	1.43E-06	SedBAF	2.57E-06	1.43E-06	SedBAF
2,3,7,8-TCDD	1	1	1	8/27	4.30E-06	1.72E-06	NA	1.01E-06	4.05E-07	SedBAF	1.01E-06	4.05E-07	SedBAF
2,3,7,8-TCDF	0.05	1	0.1	27/27	2.90E-05	1.16E-05	NA	5.30E-06	2.12E-06	SedBAF	5.30E-06	2.12E-06	SedBAF
OCDD	0.0001	0.0001	0.0003	27/27	3.30E-02	6.64E-03	NA	1.39E-05	2.79E-06	SedBAF	1.39E-05	2.79E-06	SedBAF
OCDF	0.0001	0.0001	0.0003	25/27	8.80E-04	2.67E-04	NA	9.77E-06	2.96E-06	SedBAF	9.77E-06	2.96E-06	SedBAF
TCDD TEQ (ND = 0)	NA	NA	NA	27/27	2.27E-05	8.53E-06	NA	5.34E-06	2.00E-06	SedBAF[D]	5.34E-06	2.00E-06	SedBAF[D]
TCDD TEQ (ND = DL)	NA	NA	NA	27/27	7.77E-05	2.59E-05	NA	1.82E-05	6.09E-06	SedBAF[D]	1.82E-05	6.09E-06	SedBAF[D]
INORGANICS													
CYANIDE (TOTAL)	NA	NA	NA	16/19	8.40E+01	3.37E+01	NA	8.40E+01	3.37E+01	SedBAF	8.40E+01	3.37E+01	SedBAF
METALS													
ALUMINUM	NA	NA	NA	19/19	2.51E+04	2.22E+04	5/5	7.20E+00	6.46E+00	Crab Tissue	1.00E+02	8.87E+01	Bioaccumulation BAF
ANTIMONY	NA	NA	NA	37/37	3.30E+00	1.42E+00	5/5	3.91E-02	3.39E-02	Crab Tissue	1.04E-01	4.47E-02	Bioaccumulation BAF
ARSENIC	NA	NA	NA	37/37	7.20E+01	2.76E+01	5/5	1.24E+00	1.22E+00	Crab Tissue	3.89E+00	1.49E+00	Bioaccumulation BAF
BERYLLIUM	NA	NA	NA	37/37	2.20E+00	1.66E+00	0/5	--	--	Crab Tissue	0.00E+00	0.00E+00	Bioaccumulation BAF
CADMIUM	NA	NA	NA	37/37	7.70E+00	2.97E+00	5/5	1.58E-01	1.51E-01	Crab Tissue	5.97E-02	2.30E-02	Bioaccumulation BAF
CHROMIUM	NA	NA	NA	37/37	5.04E+02	2.36E+02	4/5	2.12E-01	1.96E-01	Crab Tissue	2.36E+00	1.11E+00	Bioaccumulation BAF
COBALT	NA	NA	NA	19/19	5.30E+01	2.94E+01	5/5	1.38E-01	1.26E-01	Crab Tissue	5.12E-01	2.84E-01	Bioaccumulation BAF
COPPER	NA	NA	NA	37/37	5.95E+02	1.72E+02	5/5	1.25E+01	1.07E+01	Crab Tissue	4.61E+00	1.33E+00	Bioaccumulation BAF
IRON	NA	NA	NA	19/19	1.20E+05	7.64E+04	5/5	5.01E+01	4.47E+01	Crab Tissue	5.56E+02	3.54E+02	Bioaccumulation BAF
LEAD	NA	NA	NA	37/37	1.28E+03	3.51E+02	5/5	1.71E-01	1.51E-01	Crab Tissue	4.64E+00	1.27E+00	Bioaccumulation BAF
MANGANESE	NA	NA	NA	19/19	1.59E+03	1.27E+03	5/5	1.10E+01	8.76E+00	Crab Tissue	8.69E+00	6.94E+00	Bioaccumulation BAF
MERCURY	NA	NA	NA	37/37	1.70E+00	6.86E-01	5/5	2.10E-02	1.91E-02	Crab Tissue	2.44E-02	9.83E-03	Bioaccumulation BAF
NICKEL	NA	NA	NA	37/37	5.64E+01	4.27E+01	5/5	1.95E-01	1.88E-01	Crab Tissue	6.42E-01	4.86E-01	Bioaccumulation BAF
SELENIUM	NA	NA	NA	37/37	1.23E+01	4.61E+00	5/5	1.07E+00	1.00E+00	Crab Tissue	6.45E-01	2.42E-01	Bioaccumulation BAF
SILVER	NA	NA	NA	37/37	2.80E+00	1.39E+00	5/5	3.61E-01	3.27E-01	Crab Tissue	5.66E-02	2.80E-02	Bioaccumulation BAF
THALLIUM	NA	NA	NA	33/37	9.80E-01	5.50E-01	1/5	1.29E-03	1.29E-03	Crab Tissue	1.36E-02	7.64E-03	Bioaccumulation BAF
TIN	NA	NA	NA	19/19	2.00E+02	8.52E+01	1/5	4.67E-02	4.67E-02	Crab Tissue	1.70E+00	7.23E-01	Bioaccumulation BAF
VANADIUM	NA	NA	NA	9/9	1.70E+02	1.16E+02	NA	0.00E+00	0.00E+00	Crab Tissue	9.19E+00	6.28E+00	Bioaccumulation BAF
ZINC	NA	NA	NA	37/37	2.73E+03	9.99E+02	5/5	4.59E+01	4.59E+01	Crab Tissue	6.68E+01	2.44E+01	Bioaccumulation BAF

TABLE 3.4

FREQUENCY OF DETECTION IN SEDIMENT AND EXPOSURE POINT CONCENTRATIONS (EPCS) FOR SEDIMENT AND AQUATIC ORGANISM TISSUE FOR THE COKE POINT OFFSHORE AREA GROUPING

Analyte	Toxicity Equivalency Factor[C]			Sediment (mg/kg dry wt.)			Crab Tissue (mg/kg wet wt.)[A]				Benthic Organism Tissue (mg/kg wet wt.)[B]		
	Fish	Bird	Mammal	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
PAHS													
1-METHYLNAPHTHALENE	NA	NA	NA	37/37	3.30E+00	1.33E+00	0/4	--	--	Crab Tissue	5.58E-01	2.24E-01	Bioaccumulation BAF
2-METHYLNAPHTHALENE	NA	NA	NA	37/37	6.50E+00	2.26E+00	2/4	2.80E-03	2.80E-03	Crab Tissue	2.28E-01	7.91E-02	Bioaccumulation BAF
ACENAPHTHENE	NA	NA	NA	37/37	5.90E+00	3.37E+00	5/5	1.19E-02	1.19E-02	Crab Tissue	5.00E-01	2.85E-01	Bioaccumulation BAF
ACENAPHTHYLENE	NA	NA	NA	37/37	4.10E+01	5.97E+00	4/4	6.69E-03	6.69E-03	Crab Tissue	2.06E+00	3.00E-01	Bioaccumulation BAF
ANTHRACENE	NA	NA	NA	37/37	2.10E+01	8.93E+00	2/4	1.01E-02	1.01E-02	Crab Tissue	1.73E+00	7.35E-01	Bioaccumulation BAF
BENZO(A)ANTHRACENE	NA	NA	NA	37/37	6.10E+01	1.37E+01	0/4	--	--	Crab Tissue	9.12E+00	2.04E+00	Bioaccumulation BAF
BENZO(A)PYRENE	NA	NA	NA	37/37	5.60E+01	1.25E+01	1/4	4.85E-03	4.85E-03	Crab Tissue	4.09E+00	9.17E-01	Bioaccumulation BAF
BENZO(B)FLUORANTHENE	NA	NA	NA	37/37	5.30E+01	1.27E+01	2/4	3.15E-02	2.77E-02	Crab Tissue	2.51E+00	6.00E-01	Bioaccumulation BAF
BENZO(G,H,I)PERYLENE	NA	NA	NA	37/37	2.00E+01	7.11E+00	0/4	--	--	Crab Tissue	4.65E-01	1.65E-01	Bioaccumulation BAF
BENZO(K)FLUORANTHENE	NA	NA	NA	19/37	1.80E+01	4.55E+00	1/4	3.92E-03	3.92E-03	Crab Tissue	0.00E+00	0.00E+00	Bioaccumulation BAF
CHRYSENE	NA	NA	NA	37/37	6.30E+01	1.27E+01	0/4	8.95E-03	8.95E-03	Crab Tissue	9.16E+00	1.84E+00	Bioaccumulation BAF
DIBENZO(A,H)ANTHRACENE	NA	NA	NA	34/37	6.30E+00	2.46E+00	0/4	--	--	Crab Tissue	1.12E+00	4.37E-01	Bioaccumulation BAF
FLUORANTHENE	NA	NA	NA	37/37	1.40E+02	3.02E+01	4/4	8.69E-02	7.79E-02	Crab Tissue	4.34E+01	9.37E+00	Bioaccumulation BAF
FLUORENE	NA	NA	NA	37/37	4.50E+00	2.91E+00	2/4	1.75E-03	1.75E-03	Crab Tissue	1.26E-01	8.12E-02	Bioaccumulation BAF
INDENO(1,2,3-CD)PYRENE	NA	NA	NA	37/37	2.50E+01	6.97E+00	0/4	--	--	Crab Tissue	1.41E+00	3.94E-01	Bioaccumulation BAF
NAPHTHALENE	NA	NA	NA	37/37	7.20E+03	2.15E+03	5/5	1.60E-02	1.60E-02	Crab Tissue	1.26E+02	3.76E+01	Bioaccumulation BAF
PHENANTHRENE	NA	NA	NA	37/37	2.00E+01	1.47E+01	3/4	1.60E-02	1.60E-02	Crab Tissue	1.52E+00	1.11E+00	Bioaccumulation BAF
PYRENE	NA	NA	NA	37/37	5.90E+01	1.57E+01	4/4	4.74E-02	4.13E-02	Crab Tissue	2.04E+01	5.41E+00	Bioaccumulation BAF
TOTAL HMW PAH (ND = 0)	NA	NA	NA	37/37	2.88E+02	8.65E+01	4/4	NA	NA	NA	NA	NA	NA
TOTAL HMW PAH (ND = DL)	NA	NA	NA	37/37	2.88E+02	8.66E+01	4/4	NA	NA	NA	NA	NA	NA
TOTAL LMW PAH (ND = 0)	NA	NA	NA	37/37	7.28E+03	2.20E+03	5/5	NA	NA	NA	NA	NA	NA
TOTAL LMW PAH (ND = DL)	NA	NA	NA	37/37	7.28E+03	2.20E+03	5/5	NA	NA	NA	NA	NA	NA
PCBS													
TOTAL PCBS (ND = 0)	NA	NA	NA	26/27	4.60E-01	1.80E-01	5/5	1.44E-01	1.37E-01	Crab Tissue	2.92E+00	1.14E+00	Bioaccumulation BAF
TOTAL PCBS (ND = DL)	NA	NA	NA	26/27	4.89E-01	2.65E-01	5/5	2.10E-01	1.99E-01	Crab Tissue	3.37E+00	1.83E+00	Bioaccumulation BAF
ORGANOTINS													
TRIBUTYLTIN	NA	NA	NA	1/13	1.90E-02	1.90E-02	NA	2.30E-02	2.30E-02	SedBAF	2.30E-02	2.30E-02	SedBAF
VOLATILES													
BENZENE	NA	NA	NA	3/33	7.90E-02	7.90E-02	NA	7.90E-02	7.90E-02	SedBAF	7.90E-02	7.90E-02	SedBAF
ETHYLBENZENE	NA	NA	NA	1/33	4.90E-03	4.90E-03	NA	4.90E-03	4.90E-03	SedBAF	4.90E-03	4.90E-03	SedBAF
METHYLENE CHLORIDE	NA	NA	NA	1/33	3.60E-03	3.60E-03	NA	3.60E-03	3.60E-03	SedBAF	3.60E-03	3.60E-03	SedBAF
TOLUENE	NA	NA	NA	2/33	5.70E-02	5.70E-02	NA	5.70E-02	5.70E-02	SedBAF	5.70E-02	5.70E-02	SedBAF

C) TEFs relate the toxicity of common dioxin and furan chemical to the specific toxicity of the dioxin 2,3,7,8-TCDD to fish (Van den Berg et al. 1998). These TEFs are then used to produce a weighted summation called a Toxicity Equivalency Quotient (TEQ).

A) Values derived from Crab Tissue represent either the maximum (screening level scenario) or 95% UCLM (reasonable maximum scenario) of concentrations in field collected, multi-crab composites documented in Appendix H; concentration in edible crab was derived using a mass ratio of meat to mustard of 4.36:1 (Weidou 1981). Values derived from SedBAF were calculated using sediment EPCs and the sediment BAFs presented in Table 3.8.

B) Benthic tissue EPCs were derived by multiplying the sediment EPCs against BAFs derived either from bioassays using Coke Point sediment (Bioassay BAF) or literature based information (SedBAF) as presented in Table 3.6. The Bioassay BAF was calculated using the higher maximum value of either the clam or worm tissue.

D) Sediment BAFs for TCDD TEQs were used only for human health risk assessment. Ecological risk assessment used BAFs for each congener and summed doses to allow accounting for interspecies differences.

NA = Not applicable.

-- = Chemical not detected.

Note that EPCs for Total PCBs and Total HMW and LMW PAHs are specific to individual compounds/congeners and summation is conducted later as noted in Tables 4.9 through 4.12

TABLE 3.5
FREQUENCY OF DETECTION IN SURFACE WATER AND EXPOSURE POINT CONCENTRATIONS (EPCS) IN SURFACE WATER AND AQUATIC ORGANISM TISSUE FOR THE COKE POINT OFFSHORE AREA GROUPING

Analyte	Surface Water (mg/L)			Whole body fish tissue EPCs (mg/kg wet wt.)[A]				Fish fillet tissue EPCs (mg/kg wet wt.)[A]			
	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
METALS											
ALUMINUM	51/51	9.04E-02	4.23E-02	5/5	3.22E+01	2.95E+01	Fish Tissue	5/5	2.00E+00	2.00E+00	Fish Tissue
ANTIMONY	51/51	3.20E-04	2.09E-04	5/5	8.30E-02	5.96E-02	Fish Tissue	5/5	1.40E-02	1.35E-02	Fish Tissue
ARSENIC	51/51	7.60E-03	4.38E-03	5/5	7.00E-01	6.66E-01	Fish Tissue	5/5	4.80E-01	4.43E-01	Fish Tissue
BERYLLIUM	2/51	4.70E-05	4.70E-05	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CADMIUM	0/0	--	--	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CHROMIUM	51/51	4.90E-03	3.70E-03	5/5	3.60E-01	3.01E-01	Fish Tissue	2/5	7.20E-02	7.20E-02	Fish Tissue
COBALT	51/51	5.20E-04	3.94E-04	5/5	1.10E-01	9.89E-02	Fish Tissue	5/5	3.10E-02	3.10E-02	Fish Tissue
COPPER	51/51	2.90E-03	2.34E-03	5/5	3.41E+01	3.05E+01	Fish Tissue	5/5	4.50E+00	3.37E+00	Fish Tissue
IRON	51/51	2.12E-01	1.04E-01	5/5	1.42E+02	1.32E+02	Fish Tissue	5/5	7.80E+00	7.02E+00	Fish Tissue
LEAD	51/51	5.60E-04	1.93E-04	5/5	7.80E-01	7.74E-01	Fish Tissue	5/5	2.60E-01	2.49E-01	Fish Tissue
MANGANESE	51/51	1.98E-01	7.01E-02	5/5	1.47E+01	1.42E+01	Fish Tissue	5/5	4.00E+00	3.52E+00	Fish Tissue
MERCURY	5/51	6.30E-05	5.73E-05	5/5	3.40E-02	3.40E-02	Fish Tissue	5/5	5.60E-02	5.55E-02	Fish Tissue
NICKEL	51/51	7.90E-03	6.36E-03	5/5	1.50E-01	1.36E-01	Fish Tissue	5/5	6.20E-02	6.02E-02	Fish Tissue
SELENIUM	51/51	2.45E-02	1.35E-02	5/5	1.80E+00	1.70E+00	Fish Tissue	5/5	9.70E-01	9.25E-01	Fish Tissue
SILVER	0/0	--	--	5/5	4.90E-01	4.14E-01	Fish Tissue	2/5	4.20E-02	4.20E-02	Fish Tissue
THALLIUM	37/51	1.30E-04	5.62E-05	2/5	9.50E-03	9.50E-03	Fish Tissue	0/5	--	--	Fish Tissue
TIN	11/51	3.20E-03	2.45E-03	5/5	2.80E-01	2.73E-01	Fish Tissue	3/5	1.40E-01	1.40E-01	Fish Tissue
VANADIUM	48/51	2.80E-03	1.08E-03	NA	0.00E+00	0.00E+00	Fish Tissue	NA	0.00E+00	0.00E+00	Fish Tissue
ZINC	51/51	8.46E-02	1.64E-02	5/5	3.21E+01	3.11E+01	Fish Tissue	5/5	1.36E+01	1.28E+01	Fish Tissue
PAHS											
1-METHYLNAPHTHALENE	43/96	2.00E-04	6.77E-05	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
2-METHYLNAPHTHALENE	63/96	3.50E-04	8.77E-05	1/5	5.00E-03	5.00E-03	Fish Tissue	0/5	--	--	Fish Tissue
ACENAPHTHENE	21/96	1.00E-04	5.35E-05	4/5	1.10E-02	9.68E-03	Fish Tissue	1/5	3.60E-03	3.60E-03	Fish Tissue
ACENAPHTHYLENE	22/96	2.40E-04	6.96E-05	5/5	9.00E-03	8.80E-03	Fish Tissue	0/5	--	--	Fish Tissue
ANTHRACENE	21/96	1.80E-03	1.37E-04	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(A)ANTHRACENE	20/96	8.70E-03	9.80E-04	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(A)PYRENE	21/96	6.80E-03	7.59E-04	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(B)FLUORANTHENE	21/96	8.00E-03	9.84E-04	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(G,H,I)PERYLENE	22/96	9.60E-03	1.13E-03	1/5	8.40E-04	8.40E-04	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(K)FLUORANTHENE	21/96	9.20E-03	1.02E-03	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CHRYSENE	20/96	9.60E-03	1.09E-03	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
DIBENZO(A,H)ANTHRACENE	21/96	1.10E-02	1.22E-03	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
FLUORANTHENE	50/96	4.70E-03	4.32E-04	4/5	5.90E-02	5.10E-02	Fish Tissue	1/5	1.40E-02	1.35E-02	Fish Tissue
FLUORENE	40/96	1.50E-04	6.07E-05	1/5	7.20E-03	7.20E-03	Fish Tissue	0/5	--	--	Fish Tissue
INDENO(1,2,3-CD)PYRENE	23/96	9.90E-03	1.16E-03	1/5	3.20E-03	3.20E-03	Fish Tissue	0/5	--	--	Fish Tissue
NAPHTHALENE	92/96	6.70E-03	1.27E-03	2/5	1.90E-02	1.82E-02	Fish Tissue	2/5	1.30E-02	1.30E-02	Fish Tissue
PHENANTHRENE	84/96	1.20E-03	1.43E-04	1/5	1.00E-02	9.69E-03	Fish Tissue	2/5	5.80E-03	5.80E-03	Fish Tissue

TABLE 3.5
FREQUENCY OF DETECTION IN SURFACE WATER AND EXPOSURE POINT CONCENTRATIONS (EPCS) IN SURFACE WATER AND AQUATIC ORGANISM TISSUE FOR THE COKE POINT OFFSHORE AREA GROUPING

Analyte	Surface Water (mg/L)			Whole body fish tissue EPCs (mg/kg wet wt.)[A]				Fish fillet tissue EPCs (mg/kg wet wt.)[A]			
	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Frequency of Detection	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
PYRENE	29/96	4.70E-03	4.55E-04	1/5	5.40E-03	5.40E-03	Fish Tissue	0/5	--	--	Fish Tissue
TOTAL HMW PAH (ND = 0)	30/96	7.59E-02	1.05E-02	2/5	NA	NA	NA	0/5	NA	NA	NA
TOTAL HMW PAH (ND = DL)	30/96	7.59E-02	6.13E-03	2/5	NA	NA	NA	0/5	NA	NA	NA
TOTAL LMW PAH (ND = 0)	94/96	8.08E-03	2.21E-03	5/5	NA	NA	NA	3/5	NA	NA	NA
TOTAL LMW PAH (ND = DL)	94/96	8.08E-03	2.26E-03	5/5	NA	NA	NA	3/5	NA	NA	NA
PCBS											
TOTAL PCBS (ND = 0)	--	--	--	5/5	5.37E-01	5.20E-01	Fish Tissue	5/5	1.92E-01	1.79E-01	Fish Tissue
TOTAL PCBS (ND = DL)	--	--	--	5/5	5.57E-01	5.40E-01	Fish Tissue	5/5	1.67E-01	2.00E-01	Fish Tissue
VOLATILES											
1,2-DICHLOROBENZENE	1/96	2.90E-03	2.90E-03	NA	2.47E-01	2.47E-01	SWBAF	NA	2.47E-01	2.47E-01	SWBAF
BENZENE	50/96	7.20E-02	1.25E-02	NA	8.50E-01	1.47E-01	SWBAF	NA	8.50E-01	1.47E-01	SWBAF
CHLOROFORM	1/96	1.00E-03	1.00E-03	NA	9.26E-03	9.26E-03	SWBAF	NA	9.26E-03	9.26E-03	SWBAF
ETHYLBENZENE	9/96	4.00E-02	2.59E-03	NA	2.22E+00	1.44E-01	SWBAF	NA	2.22E+00	1.44E-01	SWBAF
TOLUENE	59/84	1.50E-02	2.79E-03	NA	4.41E-01	8.20E-02	SWBAF	NA	4.41E-01	8.20E-02	SWBAF
TOTAL XYLENES	14/42	6.50E-03	4.44E-03	NA	3.46E-01	2.36E-01	SWBAF	NA	3.46E-01	2.36E-01	SWBAF

A) Values derived from Fish Tissue represent either the maximum (screening level scenario) or 95% UCLM (reasonable maximum scenario) of concentrations in field collected, whole body, multi-fish composites documented in Appendix H. Values derived from SWBAF were calculated using surface water EPCs and the surface water BAFs presented in Table 3.9.

NA = Not applicable.

ND = Non-detected

DL = Detection Limit, which is, in this case, the reporting Limit

-- = Chemical not detected.

Notes:

EPCs for Total PCBs and Total HMW and LMW PAHs are specific to individual compounds/congeners and summation is conducted later as noted in Tables 4.9 through 4.12

For cadmium and silver, while there were no detections of these chemicals in surface water, they were detected in the fish tissues collected from field studies.

Vanadium was analyzed for, but not detected in, field collected fish tissues. For the purpose of running the food web models, the value is left as "0".

TABLE 3.6

FREQUENCY OF DETECTION IN SEDIMENT AND EXPOSURE POINT CONCENTRATIONS (EPCS) IN SEDIMENT AND AQUATIC ORGANISM TISSUE FOR THE FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Analyte	Sediment (mg/kg dry wt.)			Crab Tissue (mg/kg wet wt.)[A]				Benthic Organism Tissue (mg/kg wet wt.)[B]		
	Frequency of Detection (FOD)	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	FOD	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
DIOXINS										
1,2,3,4,6,7,8-HPCDD	6/6	4.30E-04	2.65E-04	NA	3.62E-07	2.23E-07	SedBAF	3.62E-07	2.23E-07	SedBAF
1,2,3,4,6,7,8-HPCDF	4/6	9.50E-05	5.09E-05	NA	2.56E-07	1.37E-07	SedBAF	2.56E-07	1.37E-07	SedBAF
1,2,3,4,7,8,9-HPCDF	2/6	2.10E-05	2.10E-05	NA	7.42E-08	7.42E-08	SedBAF	7.42E-08	7.42E-08	SedBAF
1,2,3,4,7,8-HXCDD	2/6	4.70E-06	4.70E-06	NA	5.38E-08	5.38E-08	SedBAF	5.38E-08	5.38E-08	SedBAF
1,2,3,4,7,8-HXCDF	3/6	4.00E-05	4.00E-05	NA	1.67E-06	1.67E-06	SedBAF	1.67E-06	1.67E-06	SedBAF
1,2,3,6,7,8-HXCDD	3/6	3.00E-05	3.00E-05	NA	1.57E-06	1.57E-06	SedBAF	1.57E-06	1.57E-06	SedBAF
1,2,3,6,7,8-HXCDF	3/6	1.10E-05	1.10E-05	NA	4.59E-07	4.59E-07	SedBAF	4.59E-07	4.59E-07	SedBAF
1,2,3,7,8,9-HXCDD	3/6	2.00E-05	2.00E-05	NA	9.76E-08	9.76E-08	SedBAF	9.76E-08	9.76E-08	SedBAF
1,2,3,7,8,9-HXCDF	2/6	3.50E-06	3.50E-06	NA	3.36E-07	3.36E-07	SedBAF	3.36E-07	3.36E-07	SedBAF
1,2,3,7,8-PECDD	2/6	3.90E-06	3.90E-06	NA	7.26E-07	7.26E-07	SedBAF	7.26E-07	7.26E-07	SedBAF
1,2,3,7,8-PECDF	3/6	1.90E-05	1.90E-05	NA	5.11E-08	5.11E-08	SedBAF	5.11E-08	5.11E-08	SedBAF
2,3,4,6,7,8-HXCDF	2/6	5.40E-06	5.40E-06	NA	2.25E-07	2.25E-07	SedBAF	2.25E-07	2.25E-07	SedBAF
2,3,4,7,8-PECDF	3/6	1.10E-05	1.10E-05	NA	2.02E-06	2.02E-06	SedBAF	2.02E-06	2.02E-06	SedBAF
2,3,7,8-TCDD	0/6	--	--	NA	--	--	SedBAF	--	--	SedBAF
2,3,7,8-TCDF	4/6	1.40E-05	7.62E-06	NA	2.56E-06	1.39E-06	SedBAF	2.56E-06	1.39E-06	SedBAF
OCDD	6/6	1.10E-02	1.06E-02	NA	4.63E-06	4.46E-06	SedBAF	4.63E-06	4.46E-06	SedBAF
OCDF	6/6	8.60E-05	7.22E-05	NA	9.55E-07	8.01E-07	SedBAF	9.55E-07	8.01E-07	SedBAF
TCDD TEQ (ND = 0)	6/6	9.72E-06	4.31E-05	NA	NA	NA	SedBAF	NA	NA	SedBAF
TCDD TEQ (ND = DL)	6/6	1.15E-05	8.17E-06	NA	NA	NA	SedBAF	NA	NA	SedBAF
METALS										
ALUMINUM	3/3	2.04E+04	2.04E+04	5/5	4.18E+00	3.85E+00	Crab Tissue	8.16E+01	8.16E+01	Bioaccumulation BAF
ANTIMONY	3/3	1.70E+00	1.70E+00	5/5	4.93E-02	4.01E-02	Crab Tissue	5.35E-02	5.35E-02	Bioaccumulation BAF
ARSENIC	6/6	1.62E+01	1.07E+01	5/5	1.26E+00	1.26E+00	Crab Tissue	8.76E-01	5.79E-01	Bioaccumulation BAF
BERYLLIUM	3/3	1.70E+00	1.70E+00	0/5	--	--	Crab Tissue	0.00E+00	0.00E+00	Bioaccumulation BAF
CADMIUM	6/6	1.60E+00	1.35E+00	5/5	2.21E-01	1.85E-01	Crab Tissue	1.24E-02	1.05E-02	Bioaccumulation BAF
CHROMIUM	6/6	2.25E+02	2.04E+02	5/5	1.25E-01	1.22E-01	Crab Tissue	1.05E+00	9.56E-01	Bioaccumulation BAF
COBALT	3/3	1.98E+01	1.98E+01	5/5	1.41E-01	1.23E-01	Crab Tissue	1.91E-01	1.91E-01	Bioaccumulation BAF
COPPER	6/6	1.05E+02	9.16E+01	5/5	1.62E+01	1.44E+01	Crab Tissue	8.14E-01	7.10E-01	Bioaccumulation BAF
IRON	6/6	4.38E+04	2.74E+04	5/5	2.13E+01	2.11E+01	Crab Tissue	2.03E+02	1.27E+02	Bioaccumulation BAF
LEAD	6/6	1.21E+02	1.06E+02	5/5	4.39E-02	4.30E-02	Crab Tissue	4.39E-01	3.83E-01	Bioaccumulation BAF
MANGANESE	3/3	1.26E+03	1.26E+03	5/5	6.07E+00	5.38E+00	Crab Tissue	6.89E+00	6.89E+00	Bioaccumulation BAF
MERCURY	5/6	3.90E-01	2.27E-01	1/5	2.66E-02	2.36E-02	Crab Tissue	5.59E-03	3.25E-03	Bioaccumulation BAF
NICKEL	6/6	3.74E+01	2.45E+01	5/5	2.29E-01	2.12E-01	Crab Tissue	4.26E-01	2.79E-01	Bioaccumulation BAF
SELENIUM	3/6	2.40E+00	2.40E+00	5/5	1.13E+00	1.10E+00	Crab Tissue	1.26E-01	1.26E-01	Bioaccumulation BAF
SILVER	6/6	9.40E-01	8.58E-01	5/5	3.69E-01	3.15E-01	Crab Tissue	1.90E-02	1.74E-02	Bioaccumulation BAF
THALLIUM	3/3	2.80E-01	2.80E-01	1/5	8.52E-03	8.52E-03	Crab Tissue	3.89E-03	3.89E-03	Bioaccumulation BAF
TIN	3/3	3.85E+01	3.85E+01	3/5	2.72E-01	2.53E-01	Crab Tissue	3.26E-01	3.26E-01	Bioaccumulation BAF
VANADIUM	3/3	9.44E+01	9.44E+01	NA	0.00E+00	0.00E+00	Crab Tissue	5.11E+00	5.11E+00	Bioaccumulation BAF
ZINC	6/6	4.29E+02	3.76E+02	5/5	4.76E+01	4.69E+01	Crab Tissue	1.05E+01	9.20E+00	Bioaccumulation BAF

TABLE 3.6

FREQUENCY OF DETECTION IN SEDIMENT AND EXPOSURE POINT CONCENTRATIONS (EPCS) IN SEDIMENT AND AQUATIC ORGANISM TISSUE FOR THE FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Analyte	Sediment (mg/kg dry wt.)			Crab Tissue (mg/kg wet wt.)[A]				Benthic Organism Tissue (mg/kg wet wt.)[B]		
	Frequency of Detection (FOD)	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	FOD	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
PAHS										
1-METHYLNAPHTHALENE	3/6	3.30E-01	3.30E-01	1/5	5.23E-04	5.23E-04	Crab Tissue	5.58E-02	5.58E-02	Bioaccumulation BAF
2-METHYLNAPHTHALENE	5/6	6.30E-01	5.74E-01	0/5	--	--	Crab Tissue	2.21E-02	2.01E-02	Bioaccumulation BAF
ACENAPHTHENE	2/6	4.40E-01	4.40E-01	1/5	1.46E-03	1.46E-03	Crab Tissue	3.73E-02	3.73E-02	Bioaccumulation BAF
ACENAPHTHYLENE	3/6	3.80E-01	3.80E-01	0/5	--	--	Crab Tissue	1.91E-02	1.91E-02	Bioaccumulation BAF
ANTHRACENE	5/6	6.50E-01	5.92E-01	0/5	--	--	Crab Tissue	5.35E-02	4.88E-02	Bioaccumulation BAF
BENZO(A)ANTHRACENE	6/6	1.20E+00	1.20E+00	0/5	--	--	Crab Tissue	1.79E-01	1.79E-01	Bioaccumulation BAF
BENZO(A)PYRENE	6/6	1.10E+00	1.10E+00	0/5	--	--	Crab Tissue	8.04E-02	8.04E-02	Bioaccumulation BAF
BENZO(B)FLUORANTHENE	6/6	1.90E+00	1.90E+00	0/5	--	--	Crab Tissue	9.00E-02	9.00E-02	Bioaccumulation BAF
BENZO(G,H,I)PERYLENE	6/6	8.30E-01	8.30E-01	1/5	4.15E-03	4.15E-03	Crab Tissue	1.93E-02	1.93E-02	Bioaccumulation BAF
BENZO(K)FLUORANTHENE	3/6	2.70E-02	2.70E-02	0/5	--	--	Crab Tissue	0.00E+00	0.00E+00	Bioaccumulation BAF
CHRYSENE	6/6	1.00E+00	1.00E+00	0/5	--	--	Crab Tissue	1.45E-01	1.45E-01	Bioaccumulation BAF
DIBENZO(A,H)ANTHRACENE	4/6	2.60E-01	1.49E-01	0/5	--	--	Crab Tissue	4.62E-02	2.65E-02	Bioaccumulation BAF
FLUORANTHENE	6/6	2.20E+00	2.20E+00	0/5	--	--	Crab Tissue	6.82E-01	6.82E-01	Bioaccumulation BAF
FLUORENE	4/6	6.30E-01	3.22E-01	0/5	--	--	Crab Tissue	1.76E-02	8.99E-03	Bioaccumulation BAF
INDENO(1,2,3-CD)PYRENE	6/6	8.70E-01	8.70E-01	0/5	--	--	Crab Tissue	4.92E-02	4.92E-02	Bioaccumulation BAF
NAPHTHALENE	6/6	8.30E+00	8.30E+00	2/5	8.96E-04	8.96E-04	Crab Tissue	1.45E-01	1.45E-01	Bioaccumulation BAF
PHENANTHRENE	6/6	2.00E+00	2.00E+00	2/5	4.55E-03	4.55E-03	Crab Tissue	1.52E-01	1.52E-01	Bioaccumulation BAF
PYRENE	6/6	1.40E+00	1.40E+00	0/5	--	--	Crab Tissue	4.84E-01	4.84E-01	Bioaccumulation BAF
TOTAL HMW PAH (ND = 0)	6/6	8.56E+00	8.56E+00	1/5	NA	NA	NA	NA	NA	NA
TOTAL HMW PAH (ND = DL)	6/6	8.67E+00	8.67E+00	1/5	NA	NA	NA	NA	NA	NA
TOTAL LMW PAH (ND = 0)	6/6	1.56E+01	1.56E+01	3/5	NA	NA	NA	NA	NA	NA
TOTAL LMW PAH (ND = DL)	6/6	1.56E+01	1.56E+01	3/5	NA	NA	NA	NA	NA	NA
PCBS										
TOTAL PCBS (ND = 0)	6/6	4.34E-02	3.94E-02	5/5	2.22E-01	2.08E-01	Crab Tissue	2.75E-01	2.50E-01	Bioaccumulation BAF
TOTAL PCBS (ND = DL)	6/6	5.83E-02	5.32E-02	5/5	2.84E-01	2.72E-01	Crab Tissue	4.02E-01	3.67E-01	Bioaccumulation BAF

A) Values derived from Crab Tissue represent either the maximum (screening level scenario) or 95% UCLM (reasonable maximum scenario) of concentrations in field collected, multi-crab composites documented in Appendix H; concentratior mass ratio of meat to mustard of 4.36:1 (Weidou 1981). Values derived from SedBAF were calculated using sediment EPCs and the sediment BAFs presented in Table 3.8.

B) Benthic tissue EPCs were derived by multiplying the sediment EPCs against BAFs derived from either bioassays using Coke Point sediment (Bioassay BAF) or or literature based information (SedBAF) as presented in Table 3.8. The Bioassay BAF was calculated using the higher maximum value of either the clam or worm tissue.

NA = Not applicable.

ND = Non-detected

the reporting Limit

-- = Chemical was not analyzed for in benthic organism tissues or was not detected in crab tissue.

Notes:

Vanadium was analyzed for, but not detected in, field collected crab tissues. Likewise, beryllium was analyzed for, but not detected in benthic tissue. For the purpose of running the food web models, the value is left as "0".

TABLE 3.7
FREQUENCY OF DETECTION IN SURFACE WATER AND EXPOSURE POINT CONCENTRATIONS (EPCS) IN SURFACE WATER AND AQUATIC ORGANISM TISSUE FOR THE FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Analyte[A]	Surface Water (mg/L)			Whole body fish tissue EPCs (mg/kg wet wt.)[A]				Fish fillet tissue EPCs (mg/kg wet wt.)[A]			
	Frequency of Detection (FOD)	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	FOD	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source	FOD	Screening Level Scenario EPC	Reasonable Maximum Scenario EPC	Source
METALS											
ALUMINUM	9/9	1.06E-01	8.59E-02	5/5	8.36E+01	6.93E+01	Fish Tissue	5/5	9.80E-01	9.28E-01	Fish Tissue
ANTIMONY	9/9	3.00E-04	2.53E-04	5/5	6.90E-02	5.27E-02	Fish Tissue	5/5	8.60E-02	6.09E-02	Fish Tissue
ARSENIC	9/9	6.40E-03	4.69E-03	5/5	8.10E-01	8.02E-01	Fish Tissue	5/5	5.70E-01	5.62E-01	Fish Tissue
BERYLLIUM	1/9	3.80E-05	3.80E-05	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CADMIUM	0/9	--	--	0/5	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CHROMIUM	9/9	1.42E-02	1.26E-02	5/5	6.80E-01	6.80E-01	Fish Tissue	1/5	4.60E-02	4.60E-02	Fish Tissue
COBALT	9/9	6.80E-04	4.83E-04	5/5	1.10E-01	1.07E-01	Fish Tissue	5/5	3.20E-02	2.90E-02	Fish Tissue
COPPER	9/9	2.60E-03	2.35E-03	5/5	2.57E+01	2.30E+01	Fish Tissue	5/5	1.41E+01	9.10E+00	Fish Tissue
IRON	9/9	2.46E-01	1.54E-01	5/5	1.26E+02	1.08E+02	Fish Tissue	5/5	8.60E+00	6.81E+00	Fish Tissue
LEAD	8/9	4.60E-04	3.52E-04	5/5	4.10E-01	3.82E-01	Fish Tissue	5/5	6.10E-02	5.89E-02	Fish Tissue
MANGANESE	9/9	8.54E-02	8.14E-02	5/5	2.38E+01	2.04E+01	Fish Tissue	5/5	2.70E+00	2.23E+00	Fish Tissue
MERCURY	3/9	3.90E-05	3.90E-05	5/5	4.50E-02	3.82E-02	Fish Tissue	5/5	4.60E-02	4.60E-02	Fish Tissue
NICKEL	9/9	6.60E-03	5.66E-03	5/5	2.40E-01	2.25E-01	Fish Tissue	5/5	4.20E-02	4.20E-02	Fish Tissue
SELENIUM	9/9	1.71E-02	1.26E-02	5/5	1.40E+00	1.35E+00	Fish Tissue	5/5	1.00E+00	1.00E+00	Fish Tissue
SILVER	0/9	--	--	5/5	2.40E-01	1.97E-01	Fish Tissue	2/5	1.20E-01	9.17E-02	Fish Tissue
THALLIUM	4/9	1.00E-04	9.11E-05	0/5	--	--	Fish Tissue	3/5	6.30E-03	6.30E-03	Fish Tissue
TIN	3/9	3.70E-03	3.70E-03	5/5	2.90E-01	2.86E-01	Fish Tissue	3/5	2.50E-01	2.43E-01	Fish Tissue
VANADIUM	8/9	2.10E-03	1.52E-03	NA	--	--	Fish Tissue	NA	--	--	Fish Tissue
ZINC	9/9	9.00E-03	6.64E-03	5/5	2.43E+01	2.41E+01	Fish Tissue	5/5	3.15E+01	2.42E+01	Fish Tissue
PAHS											
1-METHYLNAPHTHALENE	2/9	6.70E-05	6.70E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
2-METHYLNAPHTHALENE	4/9	1.50E-04	1.23E-04	1/4	4.40E-03	4.40E-03	Fish Tissue	0/5	--	--	Fish Tissue
ACENAPHTHENE	1/9	1.70E-05	1.70E-05	2/5	5.10E-03	5.10E-03	Fish Tissue	0/5	--	--	Fish Tissue
ACENAPHTHYLENE	0/9	--	--	2/5	1.90E-03	1.90E-03	Fish Tissue	0/5	--	--	Fish Tissue
ANTHRACENE	1/9	2.40E-05	2.40E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(A)ANTHRACENE	2/9	1.40E-04	1.40E-04	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(A)PYRENE	2/9	5.10E-05	5.10E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(B)FLUORANTHENE	2/9	4.90E-05	4.90E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(G,H,I)PERYLENE	1/9	7.40E-05	7.40E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
BENZO(K)FLUORANTHENE	2/9	6.90E-05	6.90E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
CHRYSENE	2/9	1.10E-04	1.10E-04	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
DIBENZO(A,H)ANTHRACENE	1/9	7.30E-05	7.30E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
FLUORANTHENE	4/9	5.60E-04	4.88E-04	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
FLUORENE	0/9	--	--	2/5	5.20E-03	5.20E-03	Fish Tissue	0/5	--	--	Fish Tissue
INDENO(1,2,3-CD)PYRENE	1/9	7.30E-05	7.30E-05	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
NAPHTHALENE	5/9	3.60E-04	1.73E-04	0/4	--	--	Fish Tissue	1/5	6.60E-03	6.60E-03	Fish Tissue
PHENANTHRENE	5/9	1.30E-04	1.14E-04	1/4	1.00E-02	9.68E-03	Fish Tissue	1/5	6.30E-03	6.30E-03	Fish Tissue
PYRENE	2/9	3.10E-04	3.10E-04	0/4	--	--	Fish Tissue	0/5	--	--	Fish Tissue
TOTAL HMW PAH (ND = 0)	2/9	7.18E-04	7.18E-04	0/4	NA	NA	Fish Tissue	0/5	NA	NA	Fish Tissue
TOTAL HMW PAH (ND = DL)	2/9	1.29E-03	1.29E-03	0/4	NA	NA	Fish Tissue	0/5	NA	NA	Fish Tissue
TOTAL LMW PAH (ND = 0)	9/9	7.89E-04	5.96E-04	3/5	NA	NA	Fish Tissue	1/5	NA	NA	Fish Tissue
TOTAL LMW PAH (ND = DL)	7/9	1.72E-03	1.61E-03	3/5	NA	NA	Fish Tissue	1/5	NA	NA	Fish Tissue
PCBS											
TOTAL PCBS (ND = 0)	--	--	--	5/5	4.54E-01	4.54E-01	Fish Tissue	5/5	3.40E-01	2.70E-01	Fish Tissue
TOTAL PCBS (ND = DL)	--	--	--	5/5	4.74E-01	4.74E-01	Fish Tissue	5/5	3.60E-01	2.90E-01	Fish Tissue

A) Values derived from Fish Tissue represent either the maximum (screening level scenario) or 95% UCLM (reasonable maximum scenario) of concentrations in field collected, whole body, multi-fish composites documented in Appendix H.

NA - Not analyzed

ND = Non-detected

reporting Limit

-- = Chemical was not detected in sediment or fish tissue.

Note:

EPCs for Total PCBs and Total HMW and LMW PAHs are specific to individual compounds/congeners and summation is conducted later as noted in Tables 4.9 through 4.12

TABLE 3.8
UPTAKE MODELS RELATING CONCENTRATIONS IN SEDIMENT TO CONCENTRATIONS IN BENTHIC ORGANISMS

Chemical	Food Item (Fish) Uptake			
	BSAF	SEDBAF (mg/kg dry wt. to mg/kg dry wt.)	SEDBAF (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source[A]
DIOXINS				
1,2,3,4,6,7,8-HPCDD	3.22E-03	3.37E-03	8.41E-04	USACE 2009; BSAF extrapolated using information from freshwater studies applied to marine/estuarine BSAF for TCDD
1,2,3,4,6,7,8-HPCDF	1.03E-02	1.08E-02	2.69E-03	
1,2,3,4,7,8,9-HPCDF	1.35E-02	1.41E-02	3.53E-03	
1,2,3,4,7,8-HXCDD	4.38E-02	4.58E-02	1.14E-02	
1,2,3,4,7,8-HXCDF	1.60E-01	1.67E-01	4.17E-02	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs; used 1,2,3,6,7,8-HxCDF as surrogate
1,2,3,6,7,8-HXCDD	2.01E-01	2.09E-01	5.24E-02	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs
1,2,3,6,7,8-HXCDF	1.60E-01	1.67E-01	4.17E-02	
1,2,3,7,8,9-HXCDD	1.87E-02	1.95E-02	4.88E-03	
1,2,3,7,8,9-HXCDF	3.67E-01	3.84E-01	9.59E-02	
1,2,3,7,8-PECDD	7.13E-01	7.44E-01	1.86E-01	
1,2,3,7,8-PECDF	1.03E-02	1.08E-02	2.69E-03	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs; used 1,2,4,6,8-PECDF as surrogate
2,3,4,6,7,8-HXCDF	1.60E-01	1.67E-01	4.17E-02	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs; used 1,2,3,6,7,8-HxCDF as surrogate
2,3,4,7,8-PECDF	7.03E-01	7.34E-01	1.84E-01	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs
2,3,7,8-TCDD	9.00E-01	9.40E-01	2.35E-01	
2,3,7,8-TCDF	7.00E-01	7.31E-01	1.83E-01	
OCDD	1.61E-03	1.68E-03	4.21E-04	
OCDF	4.25E-02	4.44E-02	1.11E-02	
TCDD TEQ (ND = 0)	9.00E-01	9.40E-01	2.35E-01	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs; used2,3,7,8-TCDD as surrogate
TCDD TEQ (ND = DL)	9.00E-01	9.40E-01	2.35E-01	
INORGANICS				
CYANIDE (TOTAL)	Uptake Factor	1.00E+00	1.00E+00	Default
METALS				
ALUMINUM	Uptake Factor	1.60E-02	4.00E-03	95% UCLM from bioaccumulation tests - worm value
ANTIMONY	Uptake Factor	1.26E-01	3.15E-02	95% UCLM from bioaccumulation tests - clam value
ARSENIC	Uptake Factor	2.16E-01	5.41E-02	95% UCLM from bioaccumulation tests - clam value
BERYLLIUM	Uptake Factor	0.00E+00	0.00E+00	Not Detected
CADMIUM	Uptake Factor	3.10E-02	7.76E-03	95% UCLM from bioaccumulation tests - worm value
CHROMIUM	Uptake Factor	1.87E-02	4.68E-03	95% UCLM from bioaccumulation tests - worm value
COBALT	Uptake Factor	3.87E-02	9.67E-03	95% UCLM from bioaccumulation tests - worm value
COPPER	Uptake Factor	3.10E-02	7.75E-03	95% UCLM from bioaccumulation tests - worm value
IRON	Uptake Factor	1.85E-02	4.63E-03	95% UCLM from bioaccumulation tests - worm value
LEAD	Uptake Factor	1.45E-02	3.62E-03	95% UCLM from bioaccumulation tests - worm value
MANGANESE	Uptake Factor	2.19E-02	5.47E-03	95% UCLM from bioaccumulation tests - worm value
MERCURY	Uptake Factor	5.73E-02	1.43E-02	95% UCLM from bioaccumulation tests - worm value
NICKEL	Uptake Factor	4.55E-02	1.14E-02	95% UCLM from bioaccumulation tests - worm value
SELENIUM	Uptake Factor	2.10E-01	5.24E-02	95% UCLM from bioaccumulation tests - worm value
SILVER	Uptake Factor	8.09E-02	2.02E-02	95% UCLM from bioaccumulation tests - worm value
THALLIUM	Uptake Factor	5.56E-02	1.39E-02	95% UCLM from bioaccumulation tests - clam value
TIN	Uptake Factor	3.39E-02	8.48E-03	95% UCLM from bioaccumulation tests - worm value
VANADIUM	Uptake Factor	2.16E-01	5.41E-02	Maximum observed metal BAF used as a surrogate.
ZINC	Uptake Factor	9.78E-02	2.45E-02	95% UCLM from bioaccumulation tests - worm value
PAHS				
1-METHYLNAPHTHALENE	Uptake Factor	--	1.69E-01	95% UCLM from bioaccumulation tests - worm value
2-METHYLNAPHTHALENE	Uptake Factor	--	3.50E-02	bioaccumulation tests - worm valueB
ACENAPHTHENE	Uptake Factor	--	8.48E-02	95% UCLM from bioaccumulation tests - worm value
ACENAPHTHYLENE	Uptake Factor	--	5.02E-02	95% UCLM from bioaccumulation tests - worm value
ANTHRACENE	Uptake Factor	--	8.24E-02	95% UCLM from bioaccumulation tests - worm value
BENZO(A)ANTHRACENE	Uptake Factor	--	1.49E-01	95% UCLM from bioaccumulation tests - clam value
BENZO(A)PYRENE	Uptake Factor	--	7.31E-02	95% UCLM from bioaccumulation tests - clam value
BENZO(B)FLUORANTHENE	Uptake Factor	--	4.74E-02	95% UCLM from bioaccumulation tests - clam value
BENZO(G,H,I)PERYLENE	Uptake Factor	--	2.33E-02	95% UCLM from bioaccumulation tests - clam value
BENZO(K)FLUORANTHENE	Uptake Factor	--	0.00E+00	Not Detected
CHRYSENE	Uptake Factor	--	1.45E-01	95% UCLM from bioaccumulation tests - clam value
DIBENZO(A,H)ANTHRACENE	Uptake Factor	--	1.78E-01	95% UCLM from bioaccumulation tests - worm value
FLUORANTHENE	Uptake Factor	--	3.10E-01	95% UCLM from bioaccumulation tests - worm value
FLUORENE	Uptake Factor	--	2.79E-02	bioaccumulation tests - worm valueB
INDENO(1,2,3-CD)PYRENE	Uptake Factor	--	5.66E-02	95% UCLM from bioaccumulation tests - worm value
NAPHTHALENE	Uptake Factor	--	1.75E-02	95% UCLM from bioaccumulation tests - worm value
PHENANTHRENE	Uptake Factor	--	7.59E-02	95% UCLM from bioaccumulation tests - clam value
PYRENE	Uptake Factor	--	3.45E-01	95% UCLM from bioaccumulation tests - clam value

TABLE 3.8
UPTAKE MODELS RELATING CONCENTRATIONS IN SEDIMENT TO CONCENTRATIONS IN BENTHIC ORGANISMS

Chemical	Food Item (Fish) Uptake			
	BSAF	SEDBAF (mg/kg dry wt. to mg/kg dry wt.)	SEDBAF (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source[A]
TOTAL HMW PAH (ND = 0)	Uptake Factor	--	1.11E-01	95% UCLM from bioaccumulation tests - clam value
TOTAL HMW PAH (ND = DL)	Uptake Factor	--	1.12E-01	95% UCLM from bioaccumulation tests - clam value
TOTAL LMW PAH (ND = 0)	Uptake Factor	--	1.13E-01	95% UCLM from bioaccumulation tests - clam value
TOTAL LMW PAH (ND = DL)	Uptake Factor	--	1.15E-01	95% UCLM from bioaccumulation tests - clam value
PCBS				
PCB 8 (BZ)	--	--	0.00E+00	Not Detected
PCB 18 (BZ)	--	--	9.34E-01	95% UCLM from bioaccumulation tests - worm value
PCB 28 (BZ)	--	--	7.02E-01	95% UCLM from bioaccumulation tests - clam value
PCB 44 (BZ)	--	--	6.91E-01	95% UCLM from bioaccumulation tests - worm value
PCB 49 (BZ)	--	--	0.00E+00	Not Detected
PCB 52 (BZ)	--	--	1.23E+00	95% UCLM from bioaccumulation tests - worm value
PCB 66 (BZ)	--	--	0.00E+00	Not Detected
PCB 77 (BZ)	--	--	0.00E+00	Not Detected
PCB 87 (BZ)	--	--	7.00E+00	bioaccumulation tests - clam valueB
PCB 101 (BZ)	--	--	0.00E+00	Not Detected
PCB 105 (BZ)	--	--	2.71E+01	bioaccumulation tests - clam valueB
PCB 118 (BZ)	--	--	4.94E-01	95% UCLM from bioaccumulation tests - worm valueC
PCB 126 (BZ)	--	--	0.00E+00	Not Detected
PCB 128 (BZ)	--	--	9.72E+01	95% UCLM from bioaccumulation tests - clam value
PCB 138 (BZ)	--	--	1.33E+02	95% UCLM from bioaccumulation tests - clam value
PCB 153 (BZ)	--	--	4.85E+01	95% UCLM from bioaccumulation tests - clam value
PCB 156 (BZ)	--	--	0.00E+00	Not Detected
PCB 169 (BZ)	--	--	0.00E+00	Not Detected
PCB 170 (BZ)	--	--	3.94E+01	bioaccumulation tests - clam valueB
PCB 180 (BZ)	--	--	0.00E+00	Not Detected
PCB 183 (BZ)	--	--	0.00E+00	Not Detected
PCB 184 (BZ)	--	--	0.00E+00	Not Detected
PCB 187 (BZ)	--	--	1.11E+00	95% UCLM from bioaccumulation tests - worm valueC
PCB 195 (BZ)	--	--	0.00E+00	Not Detected
PCB 206 (BZ)	--	--	0.00E+00	Not Detected
PCB 209 (BZ)	--	--	0.00E+00	Not Detected
TOTAL PCBS (ND = 0)	--	--	6.35E+00	95% UCLM from bioaccumulation tests - clam value
TOTAL PCBS (ND = DL)	--	--	6.90E+00	95% UCLM from bioaccumulation tests - clam value
ORGANOTINS				
DIBUTYLTIN	3.78E+00	3.94E+00	9.86E-01	USACE 2009; BAF derived from 95 UCLM of fish and estuarine/marine BSAFs
TRIBUTYLTIN	4.64E+00	4.84E+00	1.21E+00	
VOLATILES				
BENZENE	Uptake Factor	1.00E+00	1.00E+00	Default
ETHYLBENZENE	Uptake Factor	1.00E+00	1.00E+00	Default
METHYLENE CHLORIDE	Uptake Factor	1.00E+00	1.00E+00	Default
TOLUENE	Uptake Factor	1.00E+00	1.00E+00	Default

A) All derivations from BSAF assume 7.1% lipid in prey tissue and 6.8% TOC in sediment. For dioxins, ratio of the freshwater BSAF for each congener to the freshwater BSAF for TCDD was calculated and then applied to the marine/estuarine BSAF for TCDD to extrapolate a congener-specific marine/estuarine BSAF. All dat from USACE 1999.

B) The laboratory bioaccumulation studies only reported one detect value, listed in the BSAF column. This number is not a 95%UCLM.

C) Although the single clam value was higher, the worm value was chosen because it had 3 detects, providing a more realistic number.

TABLE 3.9
UPTAKE MODELS RELATING CONCENTRATIONS IN SURFACE WATER TO CONCENTRATIONS IN AQUATIC ORGANISMS

Chemical	Food Item (Fish) Uptake		
	Uptake Model[A]	BAF/Equation (mg/L to mg/kg wet wt.)	Source
DIOXINS			
1,2,3,4,6,7,8-HPCDD	Uptake Factor	3.44E+03	Regression from BCFWIN Program
1,2,3,4,6,7,8-HPCDF	Uptake Factor	4.71E+03	Regression from BCFWIN Program
1,2,3,4,7,8,9-HPCDF	Uptake Factor	4.71E+03	Regression from BCFWIN Program
1,2,3,4,7,8-HXCDD	Uptake Factor	5.40E+03	Regression from BCFWIN Program
1,2,3,4,7,8-HXCDF	Uptake Factor	4.73E+03	Regression from BCFWIN Program
1,2,3,6,7,8-HXCDD	Uptake Factor	3.40E+03	Regression from BCFWIN Program
1,2,3,6,7,8-HXCDF	Uptake Factor	4.73E+03	Regression from BCFWIN Program
1,2,3,7,8,9-HXCDD	Uptake Factor	3.40E+03	Regression from BCFWIN Program
1,2,3,7,8,9-HXCDF	Uptake Factor	6.90E+03	Regression from BCFWIN Program
1,2,3,7,8-PECDD	Uptake Factor	1.12E+04	Regression from BCFWIN Program
1,2,3,7,8-PECDF	Uptake Factor	1.40E+04	Regression from BCFWIN Program
2,3,4,6,7,8-HXCDF	Uptake Factor	4.73E+03	Regression from BCFWIN Program
2,3,4,7,8-PECDF	Uptake Factor	1.40E+04	Regression from BCFWIN Program
2,3,7,8-TCDD	Uptake Factor	1.42E+04	Regression from BCFWIN Program
2,3,7,8-TCDF	Uptake Factor	9.45E+03	Regression from BCFWIN Program
OCDD	Uptake Factor	3.44E+03	Regression from BCFWIN Program
OCDF	Uptake Factor	2.19E+03	Regression from BCFWIN Program
INORGANICS			
CYANIDE (TOTAL)	Uptake Factor	6.33E+02	From Table C-5 - EPA, 1999c
METALS			
ALUMINUM	Uptake Factor	2.70E+00	From Table C-5 - EPA, 1999c
ANTIMONY	Uptake Factor	1.00E+00	Based on bluegill in Table 5 - EPA, 1980
ARSENIC	Uptake Factor	4.00E+00	Based on bluegill in Table 5 - EPA, 1985a
BARIUM	Uptake Factor	4.00E+00	BCF from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem
BERYLLIUM	Uptake Factor	6.20E+01	From Table C-5 - EPA, 1999c
BROMIDE	Uptake Factor	1.00E+00	Default
CADMIUM	Uptake Factor	5.90E+01	Based on bluegill in Table 5 - EPA, 2001
CALCIUM	Uptake Factor	1.00E+00	Default
CHROMIUM	Uptake Factor	2.00E+02	BCF from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem
COBALT	Uptake Factor	1.00E+00	Default
COPPER	Uptake Factor	4.64E+02	Based on fathead minnow in Table 5 - EPA, 2003
FLUORIDE	Uptake Factor	1.00E+00	Default
IRON	Uptake Factor	1.00E+00	Default
LEAD	Uptake Factor	4.50E+01	Based on bluegill in Table 5 - EPA, 1985b
MAGNESIUM	Uptake Factor	1.00E+00	Default
MANGANESE	Uptake Factor	4.00E+02	BCF from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem
MERCURY	Uptake Factor	1.80E+03	Based on rainbow trout in Table 5 - EPA, 1985c
NICKEL	Uptake Factor	2.70E+01	Based on rainbow trout/fathead minnow in Table 5 - EPA, 1986
POTASSIUM	Uptake Factor	1.00E+00	Default
SELENIUM	Uptake Factor	2.42E+02	Based on bluegill in Table 5 - EPA, 1987a
SILVER	Uptake Factor	8.77E+01	From Table C-5 - EPA, 1999c
SODIUM	Uptake Factor	1.00E+00	Default
THALLIUM	Uptake Factor	1.00E+03	BCF from http://rais.ornl.gov/cgi-bin/tox/TOX_select?select=chem
TIN	Uptake Factor	3.00E+03	BCF from http://rais.ornl.gov/cgi-bin/tools/TOX_search
VANADIUM	Uptake Factor	1.00E+00	Default
ZINC	Uptake Factor	1.30E+01	Based on mummichog in Table 5 - EPA, 1987b

TABLE 3.9
UPTAKE MODELS RELATING CONCENTRATIONS IN SURFACE WATER TO CONCENTRATIONS IN AQUATIC ORGANISMS

Chemical	Food Item (Fish) Uptake		
	Uptake Model[A]	BAF/Equation (mg/L to mg/kg wet wt.)	Source
PAHS			
1-METHYLNAPHTHALENE	Uptake Factor	1.66E+02	Regression from BCFWIN Program
2-METHYLNAPHTHALENE	Uptake Factor	1.64E+02	Regression from BCFWIN Program
ACENAPHTHENE	Uptake Factor	1.79E+02	Regression from BCFWIN Program
ACENAPHTHYLENE	Uptake Factor	1.85E+02	Regression from BCFWIN Program
ANTHRACENE	Uptake Factor	4.01E+02	Regression from BCFWIN Program
BENZO(A)ANTHRACENE	Uptake Factor	5.83E+02	OEHHA 2000
BENZO(A)PYRENE	Uptake Factor	5.83E+02	OEHHA 2000
BENZO(B)FLUORANTHENE	Uptake Factor	5.83E+02	OEHHA 2000
BENZO(G,H,I)PERYLENE	Uptake Factor	5.83E+02	OEHHA 2000
BENZO(K)FLUORANTHENE	Uptake Factor	5.83E+02	OEHHA 2000
CARBAZOLE	Uptake Factor	1.32E+02	Regression from BCFWIN Program
CHRYSENE	Uptake Factor	5.83E+02	OEHHA 2000
DIBENZO(A,H)ANTHRACENE	Uptake Factor	5.83E+02	OEHHA 2000
FLUORANTHENE	Uptake Factor	5.83E+02	OEHHA 2000
FLUORENE	Uptake Factor	2.66E+02	Regression from BCFWIN Program
INDENO(1,2,3-CD)PYRENE	Uptake Factor	5.83E+02	OEHHA 2000
NAPHTHALENE	Uptake Factor	6.99E+01	Regression from BCFWIN Program
PHENANTHRENE	Uptake Factor	1.87E+03	Regression from BCFWIN Program
PYRENE	Uptake Factor	5.83E+02	OEHHA 2000
TOTAL HMW PAH (ND = 0)	Uptake Factor	NA	--
TOTAL HMW PAH (ND = DL)	Uptake Factor	NA	--
TOTAL LMW PAH (ND = 0)	Uptake Factor	NA	--
TOTAL LMW PAH (ND = DL)	Uptake Factor	NA	--
PCBS			
TOTAL PCBS (ND = 0)	Uptake Factor	5.41E+04	Regression from BCFWIN Program
TOTAL PCBS (ND = DL)	Uptake Factor	5.41E+04	Regression from BCFWIN Program
VOLATILES			
1,2-DICHLOROBENZENE	Uptake Factor	8.51E+01	Regression from BCFWIN Program
2-BUTANONE	Uptake Factor	3.16E+00	Regression from BCFWIN Program
ACETONE	Uptake Factor	3.16E+00	Regression from BCFWIN Program
ACETOPHENONE	Uptake Factor	1.33E+00	Regression from BCFWIN Program
BENZENE	Uptake Factor	1.18E+01	Regression from BCFWIN Program
CARBON DISULFIDE	Uptake Factor	8.85E+00	Regression from BCFWIN Program
CHLOROFORM	Uptake Factor	9.26E+00	Regression from BCFWIN Program
ETHYLBENZENE	Uptake Factor	5.56E+01	Regression from BCFWIN Program
STYRENE	Uptake Factor	4.11E+01	Regression from BCFWIN Program
TETRACHLOROETHENE	Uptake Factor	1.00E+00	Default
TOLUENE	Uptake Factor	2.94E+01	Regression from BCFWIN Program
TOTAL XYLENES	Uptake Factor	5.32E+01	Regression from BCFWIN Program

A - Uptake factors derived from the following sources:

Volatile organics

Values derived using the BCFWIN Program availble from EPA at
http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm

Other compounds

EPA 1999c, Table C-5	EPA 2000, Table 5
EPA 1980, Table 5 (bluegill)	EPA 1984, Table 5
EPA 1985a, Table 5	EPA 1986, Table 5
EPA 1985b, Table 5	EPA 1987a, Table 5
EPA 1985c, Table 5	EPA 1987b, Table 5

TABLE 4.1
MEASUREMENT ENDPOINTS FOR ECOLOGICAL RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Assessment Endpoint	Measurement Endpoint	On Site-Measurements/Exposure Point Concentrations (EPC)	Evaluation Method	Risk Indicators
Receptor-Specific Evaluation (SLERA & BRAPF)				
Viability of aquatic and benthic organism communities • Fish • Crustaceans • Algae	Comparison of sediment and surface water concentrations to benchmarks and to Region III BTAG Screening Levels	• Sediment and surface water concentrations measured at site in past and more recent sampling - Screening Level Concentrations - Reasonable Maximum concentrations and concentrations on a sample by sample basis	• Direct comparison to aquatic organism benchmarks from literature-based studies • Direct comparison to background concentrations	• Exceedence of benchmarks indicates potential for risks • Exceedence of benchmarks and background indicates a more certain potential for risks
	Evaluation of bioavailability	• Sediment and surface water concentrations measured at site	• Measure the potential for metals to bind using the ratio of simultaneously extracted metals (SEM) to acid volatile sulfides (AVS) • Measure uptake into clam and worm tissue in bioassays and into fish and crab tissue in the field	• SEM/AVS ratios of less than 1.0 are an indicator that metals are bound and unlikely to be bioavailable to organisms • Tissue from organisms exposed to Coke Point Offshore Area sediment demonstrate statsitically significantly higher concentrations of chemicals than those exposed to Patapsco River Background sediment.
Viability of wildlife communities • Piscivorous mammals and birds	Comparison of modeled food web doses to benchmarks • Great Blue Heron • Osprey • Raccoon • River Otter	Tissue concentrations from bioassays and field collected organisms	• Compare modeled wildlife doses to no-effects benchmarks • Compare modeled wildlife doses to low-effects benchmarks • Dose-based benchmarks from 1) USEPA EcoSSL Methodology 2) ORNL benchmarks (Sample et al., 1996) 3) Additional literatue-based sources as relevant	• Exceedence of no-effects benchmarks indicates a potential for risks • Exceedence of low-effects benchmarks indicates a more certain potential for risks
	Comparison of modeled food web doses on site to modeled food web doses for background concentrations • Great Blue Heron • Osprey • Raccoon • River Otter	• Sediment and surface water concentrations measured at site and in background areas - Screening Level and Reasonable Maximum Concentrations • Aquatic food item tissue concentrations modeled based on tissue concentrations from field/lab studies or modeled using literature-based equations - Screening Level Concentrations - Reasonable Maximum Concentrations	• Compare modeled on-site wildlife doses to modeled background wildlife doses	• Exceedence of both benchmarks and background indicates a more certain potential for risks
	Evaluation of bioavailability	• Sediment and surface water concentrations measured at site	• Measure the potential for metals to bind using the ratio of simultaneously extracted metals (SEM) to acid volatile sulfides (AVS) • Measure uptake into clam and worm tissue in bioassays and into fish and crab tissue in the field	• SEM/AVS ratios of less than 1.0 are an indicator that metals are bound and unlikely to be bioavailable to organisms • Tissue from organisms exposed to Coke Point Offshore Area sediment demonstrate statsitically significantly higher concentrations of chemicals than those exposed to Patapsco River Background sediment.
	Evaluate of Wildlife Home Range	• Sediment and surface water concentrations measured at site	• Compare wildlife home range to size of site. • Compare wildlife feeding habits to assumptions utilized in the risk assessment.	• Home ranges greater in size than the site indicate risks may be over-estimated. • Shallow water feeding habits indicate that risks may be over-estimated for chemicals elevated primarily in deeper waters.

TABLE 4.2

SEDIMENT TOXICITY REFERENCE VALUES FOR AQUATIC ORGANISM EXPOSURES

Chemicals	Brackish Sediment Threshold Effect Level TRV (mg/kg dry wt.)	Source for Threshold Effect Level TRV	Brackish Sediment Probable Effect Level TRV (mg/kg dry wt.)	Source for Probable Effect Level TRV
DIOXINS				
TCDD TEQ (ND = 0)	8.50E-07	Value is TEL from Buchman 2008	2.15E-05	Value is PEL from Buchman 2008
TCDD TEQ (ND = DL)	8.50E-07	Value is TEL from Buchman 2008	2.15E-05	Value is PEL from Buchman 2008
INORGANICS				
CYANIDE (TOTAL)	NA	---	NA	--
METALS				
ALUMINUM	1.80E+04	Value is from Buchman 2008	5.80E+04	Value is PEC from EPA ARCS 1996
ANTIMONY	2.00E+00	Value is ER-L from Long and Morgan 1991	2.50E+01	Value is ER-M from Long and Morgan 1991
ARSENIC	7.24E+00	Value is TEL from Buchman 2008	4.16E+01	Value is PEL from Buchman 2008
BERYLLIUM	NA	---	NA	--
CADMIUM	6.76E-01	Value is TEL from Buchman 2008	4.21E+00	Value is PEL from Buchman 2008
CHROMIUM	5.23E+01	Value is TEL from Buchman 2008	1.60E+02	Value is PEL from Buchman 2008
COBALT	1.00E+01	Value is "Background" from Buchman 2008	5.00E+01	EPA R3 BTAG Freshwater Sediment
COPPER	1.87E+01	Value is TEL from Buchman 2008	1.08E+02	Value is PEL from Buchman 2008
IRON	2.00E+04	Value is LEL from OMEE 1993	4.00E+04	Value is SEL from OMEE 1993
LEAD	3.02E+01	Value is TEL from Buchman 2008	1.12E+02	Value is PEL from Buchman 2008
MANGANESE	4.60E+02	Value is LEL from OMEE 1993	1.10E+03	Value is SEL from OMEE 1993
MERCURY	1.30E-01	Value is TEL from Buchman 2008	6.96E-01	Value is PEL from Buchman 2008
NICKEL	1.59E+01	Value is TEL from Buchman 2008	4.28E+01	Value is PEL from Buchman 2008
SELENIUM	1.00E+00	Value is AET from Buchman 2008	NA	--
SILVER	7.30E-01	Value is TEL from Buchman 2008	1.77E+00	Value is PEL from Buchman 2008
THALLIUM	NA	---	NA	--
TIN	3.40E+00	Value is AET from Buchman 2008	NA	--
VANADIUM	5.70E+01	Value is AET from Buchman 2008	NA	--
ZINC	1.24E+02	Value is TEL from Buchman 2008	2.71E+02	Value is PEL from Buchman 2008
PAHS				
TOTAL HMW PAH (ND = 0)	6.55E-01	Value is TEL from Buchman 2008	6.68E+00	Value is PEL from Buchman 2008
TOTAL HMW PAH (ND = DL)	6.55E-01	Value is TEL from Buchman 2008	6.68E+00	Value is PEL from Buchman 2008
TOTAL LMW PAH (ND = 0)	3.12E-01	Value is TEL from Buchman 2008	1.44E+00	Value is PEL from Buchman 2008
TOTAL LMW PAH (ND = DL)	3.12E-01	Value is TEL from Buchman 2008	1.44E+00	Value is PEL from Buchman 2008
PCBS				
TOTAL PCBS (ND = 0)	5.98E-02	Value is consensus-based TEC from MacDonald et al. 2000	6.76E-01	Value is consensus-based PEC from MacDonald et al. 2000
TOTAL PCBS (ND = DL)	5.98E-02	Value is consensus-based TEC from MacDonald et al. 2000	6.76E-01	Value is consensus-based PEC from MacDonald et al. 2000
ORGANOTINS				
TRIBUTYLTIN	3.40E+00	Value is surrogate (tin) from Buchman 2008	NA	--
VOLATILES				
BENZENE	6.46E+00	DiToro et al. 2000 assuming 1% OC	NA	--
ETHYLBENZENE	9.70E+00	DiToro et al. 2000 assuming 1% OC	NA	--
TOLUENE	8.20E+00	DiToro et al. 2000 assuming 1% OC	NA	--

NA - TRV not available
ER-L = Effects Range - Low
ER-M= Effects Range- Medium
AET = Apparent Effects Thresholds
PEL= probable effects level
TEC= threshold effects concentration
TEL= threshold effects level

Notes:

OMEE 1993 values are for freshwater sediments.
ARCS = Assessment and Remediation of Contaminated Sediments

TABLE 4.3
SURFACE WATER TOXICITY REFERENCE VALUES FOR AQUATIC AND BENTHIC ORGANISM EXPOSURES

Chemical	Surface Water TRV (mg/L)	Source for Surface Water TRVs
METALS		
ALUMINUM	8.70E-02	NRWQC
ANTIMONY	3.00E-02	Values are draft FAV and FCV values (USEPA 1988)
ARSENIC	3.60E-02	NRWQC; Value for total arsenic
BERYLLIUM	5.30E-03	Suter and Tsao 1996; Value presented is the freshwater LOEL
CHROMIUM	5.00E-02	NRWQC; Vlaue for hexachrome
COBALT	2.30E+01	Tier II freshwater chronic value from Suter and Tsao 1996
COPPER	3.10E-03	NRWQC
IRON	1.00E+00	NRWQC; Freshwater chronic value
LEAD	8.10E-03	NRWQC
MANGANESE	1.20E-01	Tier II freshwater chronic value from Suter and Tsao 1996.
MERCURY	9.40E-04	NRWQC; Value for total (inorganic and organic) mercury
NICKEL	8.20E-03	NRWQC
SELENIUM	7.10E-02	NRWQC
THALLIUM	1.20E-02	Tier II freshwater chronic value from Suter and Tsao 1996.
TIN	NA	Tier II freshwater chronic value from Suter and Tsao 1996.
VANADIUM	2.00E+01	Tier II freshwater chronic value from Suter and Tsao 1996
ZINC	8.10E-02	NRWQC
PAHS		
TOTAL HMW PAH (ND = 0)	1.40E-05	Tier II freshwater chronic value from Suter and Tsao 1996 for benzo(a)pyrene.
TOTAL HMW PAH (ND = DL)	1.40E-05	
TOTAL LMW PAH (ND = 0)	2.10E-03	Tier II freshwater chronic value from Suter and Tsao 1996 for 1-methylnaphthalene.
TOTAL LMW PAH (ND = DL)	2.10E-03	
VOLATILES		
1,2-DICHLOROBENZENE	1.40E-02	Tier II freshwater chronic value from Suter and Tsao 1996.
BENZENE	1.30E-01	Tier II freshwater chronic value from Suter and Tsao 1996.
CHLOROFORM	1.24E+00	Tier II freshwater chronic value from Suter and Tsao 1996.
ETHYLBENZENE	7.30E-03	Tier II freshwater chronic value from Suter and Tsao 1996.
TOLUENE	9.80E-03	Tier II freshwater chronic value from Suter and Tsao 1996.
TOTAL XYLENES	1.30E-02	Tier II freshwater chronic value from Suter and Tsao 1996.

Notes: All values are for marine environments unless noted otherwise.
Hierarchy: NRWQC values given priority, followed by chronic values from Suter and Tsao (1996), acute values from Suter and Tsao (1996), then chronic freshwater values from Suter and Tsao (1996).
NRWQC- National Recommended Water Quality Criteria from http://www.epa.gov/waterscience/criteria/wqctable/
NA - TRV not available

TABLE 4.4
COMPARISON OF EXPOSURE POINT CONCENTRATIONS (EPCS) IN SEDIMENT TO BENTHIC TOXICITY REFERENCE VALUES (TRVS)
COKE POINT OFFSHORE AREA GROUPING

Chemical	Sediment TEL TRV (mg/kg)	Sediment PEL TRV (mg/kg)	Coke Point Offshore Area							Patapsco River Background Area	
			Frequency of Detection	Screening Level EPC (mg/kg dry wt)	TEL Hazard Quotient (HQ)[A] for Screening Level EPC	PEL HQ for Screening Level EPC	Reasonable Maximum EPC (mg/kg dry wt)	TEL HQ for Reasonable Maximum EPC	PEL HQ for Reasonable Maximum EPC	Background Screening Level (mg/kg dry wt)	Background Reasonable Maximum (mg/kg dry wt)
DIOXINS											
TCDD TEQ (ND = DL)	8.50E-07	2.15E-05	27/27	4.37E-05	***5.14E+01***	***2.03E+00***	1.71E-05	***2.02E+01***	*7.97E-01*	1.15E-05	8.17E-06
INORGANICS											
CYANIDE (TOTAL)	NA	NA	16/19	8.40E+01	--	--	3.37E+01	--	--	ND	ND
METALS											
ALUMINUM	1.80E+04	5.80E+04	19/19	2.51E+04	***1.39E+00***	*4.33E-01*	2.22E+04	***1.23E+00***	*3.82E-01*	2.04E+04	2.04E+04
ANTIMONY	2.00E+00	2.50E+01	37/37	3.30E+00	***1.65E+00***	*1.32E-01*	1.42E+00	*7.10E-01*	*5.68E-02*	1.70E+00	1.70E+00
ARSENIC	7.24E+00	4.16E+01	37/37	7.20E+01	***9.94E+00***	***1.73E+00***	2.76E+01	***3.82E+00***	*6.64E-01*	1.62E+01	1.07E+01
BERYLLIUM	NA	NA	37/37	2.20E+00	--	--	1.66E+00	--	--	1.70E+00	1.70E+00
CADMIUM	6.76E-01	4.21E+00	37/37	7.70E+00	***1.14E+01***	***1.83E+00***	2.97E+00	***4.39E+00***	*7.05E-01*	1.60E+00	1.35E+00
CHROMIUM	5.23E+01	1.60E+02	37/37	5.04E+02	***9.64E+00***	***3.14E+00***	2.36E+02	***4.52E+00***	***1.47E+00***	2.25E+02	2.04E+02
COBALT	1.00E+01	5.00E+01	19/19	5.30E+01	***5.30E+00***	***1.06E+00***	2.94E+01	***2.94E+00***	*5.87E-01*	1.98E+01	1.98E+01
COPPER	1.87E+01	1.08E+02	37/37	5.95E+02	***3.18E+01***	***5.50E+00***	1.72E+02	***9.20E+00***	***1.59E+00***	1.05E+02	9.16E+01
IRON	2.00E+04	4.00E+04	19/19	1.20E+05	***6.00E+00***	***3.00E+00***	7.64E+04	***3.82E+00***	***1.91E+00***	4.38E+04	2.74E+04
LEAD	3.02E+01	1.12E+02	37/37	1.28E+03	***4.23E+01***	***1.14E+01***	3.51E+02	***1.16E+01***	***3.12E+00***	1.21E+02	1.06E+02
MANGANESE	4.60E+02	1.10E+03	19/19	1.59E+03	***3.46E+00***	***1.45E+00***	1.27E+03	***2.76E+00***	***1.15E+00***	1.26E+03	1.26E+03
MERCURY	1.30E-01	6.96E-01	37/37	1.70E+00	***1.31E+01***	***2.44E+00***	6.86E-01	***5.28E+00***	*9.86E-01*	3.90E-01	2.27E-01
NICKEL	1.59E+01	4.28E+01	37/37	5.64E+01	***3.55E+00***	***1.32E+00***	4.27E+01	***2.68E+00***	*9.97E-01*	3.74E+01	2.45E+01
SELENIUM	1.00E+00	NA	37/37	1.23E+01	***1.23E+01***	--	4.61E+00	***4.61E+00***	--	2.40E+00	2.40E+00
SILVER	7.30E-01	1.77E+00	37/37	2.80E+00	***3.84E+00***	***1.58E+00***	1.39E+00	***1.90E+00***	*7.82E-01*	9.40E-01	8.58E-01
THALLIUM	NA	NA	33/37	9.80E-01	--	--	5.50E-01	--	--	2.80E-01	2.80E-01
TIN	3.40E+00	NA	19/19	2.00E+02	***5.88E+01***	--	8.52E+01	***2.51E+01***	--	3.85E+01	3.85E+01
VANADIUM	5.70E+01	NA	9/9	1.70E+02	***2.98E+00***	--	1.16E+02	***2.04E+00***	--	9.44E+01	9.44E+01
ZINC	1.24E+02	2.71E+02	37/37	2.73E+03	***2.20E+01***	***1.01E+01***	9.99E+02	***8.06E+00***	***3.69E+00***	4.29E+02	3.76E+02
PAHS											
TOTAL HMW PAH (ND = 0)	6.55E-01	6.68E+00	37/37	2.88E+02	***4.40E+02***	***4.32E+01***	8.65E+01	***1.32E+02***	***1.30E+01***	8.56E+00	8.56E+00
TOTAL HMW PAH (ND = DL)	6.55E-01	6.68E+00	37/37	2.88E+02	***4.40E+02***	***4.32E+01***	8.66E+01	***1.32E+02***	***1.30E+01***	8.67E+00	8.67E+00
TOTAL LMW PAH (ND = 0)	3.12E-01	1.44E+00	37/37	7.28E+03	***2.33E+04***	***5.05E+03***	2.20E+03	***7.05E+03***	***1.52E+03***	1.56E+01	1.56E+01
TOTAL LMW PAH (ND = DL)	3.12E-01	1.44E+00	37/37	7.28E+03	***2.33E+04***	***5.05E+03***	2.20E+03	***7.05E+03***	***1.52E+03***	1.56E+01	1.56E+01
PCBS											
TOTAL PCBS (ND = 0)	5.98E-02	6.76E-01	26/27	4.60E-01	***7.70E+00***	*6.81E-01*	1.80E-01	***3.01E+00***	*2.66E-01*	4.34E-02	3.94E-02
TOTAL PCBS (ND = DL)	5.98E-02	6.76E-01	26/27	4.89E-01	***8.17E+00***	*7.23E-01*	2.65E-01	***4.43E+00***	*3.92E-01*	5.83E-02	5.32E-02
ORGANOTINS											
TRIBUTYLTIN	3.40E+00	NA	1/13	1.90E-02	*5.59E-03*	--	1.90E-02	*5.59E-03*	--	ND	ND
VOLATILES											
BENZENE	6.46E+00	NA	3/33	7.90E-02	*1.22E-02*	--	7.90E-02	*1.22E-02*	--	ND	ND
ETHYLBENZENE	9.70E+00	NA	1/33	4.90E-03	*5.05E-04*	--	4.90E-03	*5.05E-04*	--	ND	ND
TOLUENE	8.20E+00	NA	2/33	5.70E-02	*6.95E-03*	--	5.70E-02	*6.95E-03*	--	ND	ND

Bold = HQ greater than 1.0
Italics = Exceeds background
Bold & Italics = HQ greater than 1.0 and exceeds background HQ.

TABLE 4.5
COMPARISON OF EXPOSURE POINT CONCENTRATIONS (EPCS) IN SURFACE WATER (TOTAL CONCENTRATIONS) TO AQUATIC ORGANISM TOXICITY REFERENCE VALUES (TRVS)
COKE POINT OFFSHORE AREA GROUPING

Chemical	Surface Water TRV (mg/L)	Coke Point Offshore Area					Patapsco River Background Area	
		Frequency of Detection	Screening Level EPC (mg/L)	HQ[A] for Screening Level EPC	Reasonable Maximum EPC (mg/L)	HQ for Reasonable Maximum	Screening Level (mg/L)	Reasonable Maximum (mg/L)
METALS								
ALUMINUM	8.70E-02	51/51	9.04E-02	**1.04E+00**	4.23E-02	*4.86E-01*	1.06E-01	8.59E-02
ANTIMONY	3.00E-02	51/51	3.20E-04	*1.07E-02*	2.09E-04	*6.97E-03*	3.00E-04	2.53E-04
ARSENIC	3.60E-02	51/51	7.60E-03	*2.11E-01*	4.38E-03	*1.22E-01*	6.40E-03	4.69E-03
BERYLLIUM	5.30E-03	2/51	4.70E-05	*8.87E-03*	4.70E-05	*8.87E-03*	3.80E-05	3.80E-05
CHROMIUM	5.00E-02	51/51	4.90E-03	9.80E-02	3.70E-03	7.40E-02	1.42E-02	1.26E-02
COBALT	2.30E+01	51/51	5.20E-04	2.26E-05	3.94E-04	*1.71E-05*	6.80E-04	4.83E-04
COPPER	3.10E-03	51/51	2.90E-03	*9.35E-01*	2.34E-03	*7.55E-01*	2.60E-03	2.35E-03
IRON	1.00E+00	51/51	2.12E-01	2.12E-01	1.04E-01	*1.04E-01*	2.46E-01	1.54E-01
LEAD	8.10E-03	51/51	5.60E-04	*6.91E-02*	1.93E-04	*2.38E-02*	4.60E-04	3.52E-04
MANGANESE	1.20E-01	51/51	1.98E-01	***1.65E+00***	7.01E-02	*5.84E-01*	8.54E-02	8.14E-02
MERCURY	9.40E-04	5/51	6.30E-05	*6.70E-02*	5.73E-05	*6.10E-02*	3.90E-05	3.90E-05
NICKEL	8.20E-03	51/51	7.90E-03	*9.63E-01*	6.36E-03	*7.76E-01*	6.60E-03	5.66E-03
SELENIUM	7.10E-02	51/51	2.45E-02	*3.45E-01*	1.35E-02	*1.90E-01*	1.71E-02	1.26E-02
THALLIUM	1.20E-02	37/51	1.30E-04	*1.08E-02*	5.62E-05	*4.68E-03*	1.00E-04	9.11E-05
TIN	NA	11/51	3.20E-03	--	2.45E-03	--	3.70E-03	3.70E-03
VANADIUM	2.00E+01	48/51	2.80E-03	*1.40E-04*	1.08E-03	5.38E-05	2.10E-03	1.52E-03
ZINC	8.10E-02	51/51	8.46E-02	***1.04E+00***	1.64E-02	*2.03E-01*	9.00E-03	6.64E-03
PAHS								
TOTAL HMW PAH (ND = 0)	1.40E-05	31/96	7.59E-02	***5.42E+03***	1.05E-02	***7.50E+02***	7.18E-04	7.18E-04
TOTAL HMW PAH (ND = DL)	1.40E-05	31/96	7.59E-02	***5.42E+03***	6.13E-03	***4.38E+02***	1.29E-03	1.29E-03
TOTAL LMW PAH (ND = 0)	2.10E-03	94/96	8.08E-03	***3.85E+00***	2.21E-03	***1.05E+00***	7.89E-04	5.96E-04
TOTAL LMW PAH (ND = DL)	2.10E-03	87/96	8.08E-03	***3.85E+00***	2.26E-03	***1.08E+00***	1.72E-03	1.61E-03
VOLATILES								
1,2-DICHLOROBENZENE	1.40E-02	1/96	2.90E-03	*2.07E-01*	2.90E-03	*2.07E-01*	ND	ND
BENZENE	1.30E-01	50/96	7.20E-02	*5.54E-01*	1.25E-02	*9.60E-02*	ND	ND
CHLOROFORM	1.24E+00	1/96	1.00E-03	*8.06E-04*	1.00E-03	*8.06E-04*	ND	ND
ETHYLBENZENE	7.30E-03	9/96	4.00E-02	***5.48E+00***	2.59E-03	*3.55E-01*	ND	ND
TOLUENE	9.80E-03	59/84	1.50E-02	***1.53E+00***	2.79E-03	*2.84E-01*	ND	ND
TOTAL XYLENES	1.30E-02	14/42	6.50E-03	*5.00E-01*	4.44E-03	*3.42E-01*	ND	ND

Bold = HQ greater than 1.0
Italics = Exceeds background
Bold & Italics = HQ greater than 1.0 and exceeds background levels.
NA= not available
ND - Not detected in background.
A) HQ = (EPC/TRV); see Table 4.2 for TRVs.

TABLE 4.6
WILDLIFE EXPOSURE FACTORS FOR ECOLOGICAL RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Exposure Parameter	Value	Units	Notes
GREAT BLUE HERON			
Body Weight	2.390	kg	USEPA 1993 (Value is average of male and female weights, 2.576 and 2.204 respectively)
Dry Food Ingestion Rate	0.045	g dry wt./g-day	USEPA 1993, converted assuming 75% prey moisture (USACHPPM 2004)
Wet Food Ingestion Rate	0.18	g wet wt./g-day	USEPA 1993
Incidental Sediment Ingestion Rate	2	% of total mass of diet, dry wt.	As a default, ingestion rate is assumed to be 2%.
Water Ingestion Rate	0.045	g/g-day	USEPA, 1993
OSPREY			
Body Weight	1.486	kg	EPA, 1993 (Value is average of male and female weights, 1.403 and 1.568 respectively)
Food Ingestion Rate	0.0525	g dry wt./g-day	EPA, 1993, converted assuming 75% prey moisture (ARAMS 2004)
Food Ingestion Rate	0.21	g wet wt./g-day	EPA, 1993
Incidental Sediment Ingestion Rate	2	% of total mass of diet, dry wt.	As a default, ingestion rate is assumed to be 2%.
Water Ingestion Rate	0.052	g/g-day	EPA, 1993
RACCOON			
Body Weight	6.8	kg	USEPA, 1993 (Value is average of adult male and female weights, 7.6 and 6.0 respectively)
Dry Food Ingestion Rate	0.17	kg dry wt./kg-day	FI (kg dry wt./kg-day) = [(0.235 $Wt^{0.822}$) / Wt. (kg)] (USEPA 1993, supported by USACHPPM 2004)
Wet Food Ingestion Rate	0.68	kg wet wt./kg-day	Converted assuming 75% prey moisture (USACHPPM 2004)
Incidental Sediment Ingestion Rate	2	% of total mass of diet, dry wt.	As a default, ingestion rate is assumed to be 2%.
Water Ingestion Rate	0.083	g/g-day	USEPA, 1993
RIVER OTTER			
Body Weight	7.4	kg	EPA, 1993 (Value is average of male and female weights, 8.13 and 6.73 respectively)
Food Ingestion Rate	0.1600	kg dry wt./kg-day	ARAMS, 2004
Food Ingestion Rate	0.6400	kg wet wt./kg-day	Converted assuming 75% prey moisture (ARAMS 2004)
Incidental Sediment Ingestion Rate	2	% of total mass of diet, dry wt.	As a default, ingestion rate is assumed to be 2%.
Water Ingestion Rate	0.081	L/kg-day	EPA, 1993

TABLE 4.7

DOSE-BASED TOXICITY REFERENCE VALUES (TRVs) FOR BIRDS

Chemical	Avian NOAEL TRV (mg/kg-bw day)	Avian NOAEL Source and Notes	Avian LOAEL TRV (mg/kg-bw day)	Avian LOAEL Source and Notes
DIOXINS				
TCDD TEQ (ND = DL)	1.40E-05	Sample et. al 1996	1.40E-04	Sample et. al 1996
INORGANICS				
CYANIDE (TOTAL)	NA	---	NA	---
METALS				
ALUMINUM	1.10E+02	Sample et. al 1996	NA	---
ANTIMONY	5.10E+00	USEPA 2005d	1.28E+01	Sample et. al 1996
ARSENIC	2.24E+00	USEPA 2005e	7.40E+00	Sample et. al 1996
BERYLLIUM	NA	---	NA	---
CADMIUM	1.45E+00	USEPA 2005g	2.00E+01	Sample et. al 1996
CHROMIUM	2.66E+00	USEPA (trivalent) 2008b	5.00E+00	Sample et. al 1996
COBALT	7.61E+00	USEPA 2005h	2.67E+01	Derived from data in USEPA 2005h
COPPER	4.05E+00	USEPA 2007a	6.17E+01	Sample et. al 1996
IRON	NA	---	NA	---
LEAD	1.63E+00	USEPA 2005i	1.13E+01	Sample et. al 1996
MANGANESE	9.97E+02	Sample et. al 1996	NA	---
MERCURY	4.50E-01	Sample et. al 1996	9.00E-01	Sample et. al 1996
NICKEL	7.74E+01	Sample et. al 1996	1.07E+02	Sample et. al 1996
SELENIUM	2.90E-01	USEPA 2007d	1.00E+00	Sample et. al 1996
SILVER	2.02E+00	USEPA 2006	6.05E+01	Derived from data in USEPA 2006
SODIUM	NA	---	NA	---
THALLIUM	3.50E-01	Derived	NA	---
TIN	6.80E+00	Sample et. al 1996	1.69E+01	Sample et. al 1996
VANADIUM	3.44E-01	USEPA 2005j	NA	---
ZINC	6.61E+01	USEPA 2007e	1.31E+02	Sample et. al 1996
PAHS				
TOTAL HMW PAH (ND = DL)	3.37E+00	USEPA 2007f	3.37E+01	USEPA 2007f
TOTAL LMW PAH (ND = DL)	3.37E+00	USEPA 2007f	3.37E+01	USEPA 2007f
PCBS				
TOTAL PCBS (ND = 0)	0.18	Sample et. al 1996	1.8	Sample et. al 1996
TOTAL PCBS (ND = DL)	0.18	Sample et. al 1996	1.8	Sample et. al 1996
ORGANOTINS				
TRIBUTYLTIN	NA	---	NA	---
VOLATILES				
1,2-DICHLOROBENZENE	NA	---	NA	---
BENZENE	NA	---	NA	---
CHLOROFORM	NA	---	NA	---
ETHYLBENZENE	NA	---	NA	---
TOLUENE	NA	---	NA	---
TOTAL XYLENES	NA	---	NA	---

NA = TRV not available

TABLE 4.8
DOSE-BASED TOXICITY REFERENCE VALUES (TRVs) FOR MAMMALS

Chemical	Mammalian NOAEL TRV (mg/kg-bw day)	Mammalian NOAEL Source and Notes	Mammalian LOAEL TRV (mg/kg-bw day)	Mammalian LOAEL Source and Notes
DIOXINS				
TCDD TEQ (ND = DL)	1.00E-06	Sample et. al 1996	1.00E-05	Sample et. al 1996
INORGANICS				
CYANIDE (TOTAL)	6.87E+01	Sample et. al 1996	NA	---
METALS				
ALUMINUM	1.93E+00	Sample et. al 1996	1.93E+01	Sample et. al 1996
ANTIMONY	5.90E-02	USEPA 2005d	1.25E+00	Sample et. al 1996
ARSENIC	1.04E+00	USEPA 2005e	1.26E+00	Sample et. al 1996
BERYLLIUM	5.32E-01	USEPA 2005f	NA	---
CADMIUM	7.70E-01	USEPA 2005g	1.00E+01	Sample et. al 1996
CHROMIUM	2.40E+00	USEPA (trivalent) 2008b	1.31E+01	Sample et. al 1996
COBALT	7.33E+00	USEPA 2005h	1.18E+02	Derived from data in USEPA 2005h
COPPER	5.60E+00	USEPA 2007a	1.54E+01	Sample et. al 1996
IRON	NA	---	NA	---
LEAD	4.70E+00	USEPA 2005i	8.00E+01	Sample et. al 1996
MANGANESE	5.15E+01	USEPA 2007b	2.84E+02	Sample et. al 1996
MERCURY	1.32E+01	Sample et. al 1996	NA	---
NICKEL	1.70E+00	USEPA 2007c	8.00E+01	Sample et. al 1996
SELENIUM	1.43E-01	USEPA 2007d	3.30E-01	Sample et. al 1996
SILVER	6.02E+00	USEPA 2006	1.16E+02	Derived from data in USEPA 2006
THALLIUM	7.40E-03	Sample et. al 1996	7.40E-02	Sample et. al 1996
TIN	2.34E+01	Sample et. al 1996	3.50E+01	Sample et. al 1996
VANADIUM	4.16E+00	USEPA 2005j	8.31E+00	Derived from data in USEPA 2005j
ZINC	7.54E+01	USEPA 2007e	3.20E+02	Sample et. al 1996
PAHS				
TOTAL HMW PAH (ND = DL)	6.15E-01	USEPA 2007f	1.08E+01	Derived from data in USEPA 2007f
TOTAL LMW PAH (ND = DL)	6.56E+01	USEPA 2007f	4.34E+02	Derived from data in USEPA 2007f
PCBS				
TOTAL PCBS (ND = 0)	0.009	Sample et. al 1996 (Aroclor 1248)	0.089	Sample et. al 1996 (Aroclor 1248)
TOTAL PCBS (ND = DL)	0.009	Sample et. al 1996 (Aroclor 1248)	0.089	Sample et. al 1996 (Aroclor 1248)
ORGANOTINS				
TRIBUTYLTIN	NA	---	NA	---
VOLATILES				
1,2-DICHLOROBENZENE	NA	---	NA	---
BENZENE	2.64E+01	Sample et. al 1996	2.64E+02	Sample et. al 1996
CHLOROFORM	1.50E+01	Sample et. al 1996	4.10E+01	Sample et. al 1996
ETHYLBENZENE	NA	---	NA	---
TOLUENE	2.60E+01	Sample et. al 1996	2.60E+02	Sample et. al 1996
TOTAL XYLENES	2.10E+00	Sample et. al 1996	2.60E+00	Sample et. al 1996

NA = TRV not available

TABLE 4.9
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO BIRDS (GREAT BLUE HERON) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.40E-05	1.40E-04	*1.50E-01*	7.48E-02	*1.50E-02*	7.48E-03	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
METALS														
ALUMINUM	1.10E+02	NA	*3.71E-01*	3.01E-01	NA	NA	*2.18E-01*	1.74E-01	NA	NA	2.59E-01	3.05E-01	NA	NA
ANTIMONY	5.10E+00	1.28E+01	*4.25E-03*	2.19E-03	*1.69E-03*	8.73E-04	1.97E-03	2.04E-03	7.83E-04	8.14E-04	*3.51E-03*	2.74E-03	*1.40E-03*	1.09E-03
ARSENIC	2.24E+00	7.40E+00	*3.42E-01*	7.70E-02	*1.04E-01*	2.33E-02	*1.29E-01*	1.08E-01	*3.90E-02*	3.26E-02	*8.53E-02*	7.17E-02	*2.58E-02*	2.17E-02
BERYLLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	1.45E+00	2.00E+01	*1.22E-02*	2.53E-03	*8.84E-04*	1.84E-04	2.44E-02	2.85E-02	1.77E-03	2.06E-03	*4.78E-03*	9.93E-04	*3.47E-04*	7.20E-05
CHROMIUM	2.66E+00	5.00E+00	*3.30E-01*	1.48E-01	*1.76E-01*	7.85E-02	*1.85E-01*	8.48E-02	*9.84E-02*	4.51E-02	*1.95E-01*	1.22E-01	*1.04E-01*	6.51E-02
COBALT	7.61E+00	2.67E+01	*1.84E-02*	6.87E-03	*5.24E-03*	1.96E-03	*9.54E-03*	5.69E-03	*2.72E-03*	1.62E-03	*8.87E-03*	4.95E-03	*2.53E-03*	1.41E-03
COPPER	4.05E+00	6.17E+01	*3.37E-01*	5.95E-02	*2.21E-02*	3.91E-03	6.87E-01	7.45E-01	4.51E-02	4.89E-02	***1.65E+00***	**1.17E+00**	*1.08E-01*	7.65E-02
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	1.63E+00	1.13E+01	***1.22E+00***	1.15E-01	*1.76E-01*	1.66E-02	*7.26E-01*	7.17E-02	*1.05E-01*	1.03E-02	*7.93E-01*	1.12E-01	*1.14E-01*	1.62E-02
MANGANESE	9.97E+02	NA	*3.01E-03*	2.38E-03	NA	NA	*3.44E-03*	2.24E-03	NA	NA	4.10E-03	5.44E-03	NA	NA
MERCURY	4.50E-01	9.00E-01	*1.31E-02*	3.02E-03	*6.57E-03*	1.51E-03	*1.18E-02*	1.14E-02	*5.90E-03*	5.72E-03	1.70E-02	1.88E-02	8.50E-03	9.39E-03
NICKEL	7.74E+01	1.07E+02	*2.15E-03*	1.43E-03	*1.56E-03*	1.03E-03	*1.11E-03*	9.72E-04	*8.06E-04*	7.03E-04	*1.01E-03*	9.97E-04	*7.30E-04*	7.21E-04
SELENIUM	2.90E-01	1.00E+00	*4.42E-01*	8.82E-02	*1.28E-01*	2.56E-02	7.09E-01	7.12E-01	2.06E-01	2.06E-01	***1.16E+00***	8.79E-01	*3.36E-01*	2.55E-01
SILVER	2.02E+00	6.05E+01	*6.30E-03*	2.11E-03	*2.10E-04*	7.06E-05	*3.34E-02*	3.33E-02	*1.12E-03*	1.11E-03	*4.49E-02*	2.18E-02	*1.50E-03*	7.28E-04
THALLIUM	3.50E-01	NA	*9.54E-03*	2.73E-03	NA	NA	3.20E-03	5.11E-03	NA	NA	*7.42E-03*	7.33E-04	NA	NA
TIN	6.80E+00	1.69E+01	*7.14E-02*	1.38E-02	*2.87E-02*	5.54E-03	*2.77E-02*	1.23E-02	*1.12E-02*	4.96E-03	*3.39E-02*	1.28E-02	*1.36E-02*	5.15E-03
VANADIUM	3.44E-01	NA	***5.26E+00***	**2.92E+00**	NA	NA	*4.45E-01*	2.47E-01	NA	NA	*4.45E-01*	2.47E-01	NA	NA
ZINC	6.61E+01	1.31E+02	*2.19E-01*	3.44E-02	*1.11E-01*	1.74E-02	*1.62E-01*	1.36E-01	*8.19E-02*	6.84E-02	*1.25E-01*	7.20E-02	*6.29E-02*	3.63E-02
PAHS														
TOTAL HMW PAH (ND = DL)	3.37E+00	3.37E+01	***2.68E+00***	6.07E-02	*2.68E-01*	6.07E-03	*1.03E-01*	2.53E-03	*1.03E-02*	2.53E-04	*9.80E-02*	2.31E-03	*9.80E-03*	2.31E-04
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***1.14E+01***	6.88E-02	***1.14E+00***	6.88E-03	***2.00E+00***	5.98E-03	*2.00E-01*	5.98E-04	***1.99E+00***	6.36E-03	*1.99E-01*	6.36E-04
PCBS														
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***2.92E+00***	2.76E-01	*2.92E-01*	2.76E-02	1.47E-01	2.22E-01	1.47E-02	2.22E-02	*5.39E-01*	4.54E-01	*5.39E-02*	4.54E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***3.38E+00***	4.03E-01	*3.38E-01*	4.03E-02	2.12E-01	2.84E-01	2.12E-02	2.84E-02	*5.59E-01*	4.74E-01	*5.59E-02*	4.74E-02
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 4.9
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO BIRDS (GREAT BLUE HERON) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
ND - Not detected in background.
NA = Not available
-- = Chemical not analyzed for
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.10
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO BIRDS (OSPREY) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.40E-05	1.40E-04	*1.75E-01*	8.73E-02	*1.75E-02*	8.73E-03	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
METALS														
ALUMINUM	1.10E+02	NA	*4.32E-01*	3.51E-01	NA	NA	*2.54E-01*	2.03E-01	NA	NA	3.02E-01	3.55E-01	NA	NA
ANTIMONY	5.10E+00	1.28E+01	*4.96E-03*	2.55E-03	*1.97E-03*	1.02E-03	2.29E-03	2.38E-03	9.14E-04	9.50E-04	*4.10E-03*	3.19E-03	*1.63E-03*	1.27E-03
ARSENIC	2.24E+00	7.40E+00	*3.99E-01*	8.99E-02	*1.21E-01*	2.72E-02	*1.50E-01*	1.26E-01	*4.55E-02*	3.80E-02	*9.96E-02*	8.37E-02	*3.01E-02*	2.53E-02
BERYLLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	1.45E+00	2.00E+01	*1.42E-02*	2.96E-03	*1.03E-03*	2.14E-04	2.85E-02	3.32E-02	2.07E-03	2.41E-03	*5.58E-03*	1.16E-03	*4.04E-04*	8.40E-05
CHROMIUM	2.66E+00	5.00E+00	*3.85E-01*	1.72E-01	*2.05E-01*	9.16E-02	*2.16E-01*	9.90E-02	*1.15E-01*	5.26E-02	*2.27E-01*	1.43E-01	*1.21E-01*	7.60E-02
COBALT	7.61E+00	2.67E+01	*2.15E-02*	8.02E-03	*6.11E-03*	2.29E-03	*1.11E-02*	6.64E-03	*3.17E-03*	1.89E-03	*1.04E-02*	5.77E-03	*2.95E-03*	1.65E-03
COPPER	4.05E+00	6.17E+01	*3.93E-01*	6.94E-02	*2.58E-02*	4.56E-03	8.02E-01	8.70E-01	5.26E-02	5.71E-02	***1.92E+00***	**1.36E+00**	*1.26E-01*	8.93E-02
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	1.63E+00	1.13E+01	***1.42E+00***	1.34E-01	*2.05E-01*	1.94E-02	*8.47E-01*	8.36E-02	*1.22E-01*	1.21E-02	*9.25E-01*	1.31E-01	*1.33E-01*	1.89E-02
MANGANESE	9.97E+02	NA	*3.52E-03*	2.78E-03	NA	NA	*4.01E-03*	2.61E-03	NA	NA	4.78E-03	6.34E-03	NA	NA
MERCURY	4.50E-01	9.00E-01	*1.53E-02*	3.52E-03	*7.67E-03*	1.76E-03	*1.38E-02*	1.33E-02	*6.88E-03*	6.67E-03	1.98E-02	2.19E-02	9.92E-03	1.10E-02
NICKEL	7.74E+01	1.07E+02	*2.51E-03*	1.67E-03	*1.82E-03*	1.21E-03	*1.30E-03*	1.13E-03	*9.40E-04*	8.20E-04	*1.18E-03*	1.16E-03	*8.52E-04*	8.41E-04
SELENIUM	2.90E-01	1.00E+00	*5.16E-01*	1.03E-01	*1.50E-01*	2.98E-02	8.27E-01	8.31E-01	2.40E-01	2.41E-01	***1.35E+00***	**1.03E+00**	*3.92E-01*	2.97E-01
SILVER	2.02E+00	6.05E+01	*7.34E-03*	2.47E-03	*2.45E-04*	8.23E-05	*3.90E-02*	3.88E-02	*1.30E-03*	1.30E-03	*5.24E-02*	2.54E-02	*1.75E-03*	8.49E-04
THALLIUM	3.50E-01	NA	*1.11E-02*	3.19E-03	NA	NA	3.73E-03	5.97E-03	NA	NA	*8.66E-03*	8.55E-04	NA	NA
TIN	6.80E+00	1.69E+01	*8.33E-02*	1.61E-02	*3.35E-02*	6.46E-03	*3.23E-02*	1.44E-02	*1.30E-02*	5.78E-03	*3.96E-02*	1.49E-02	*1.59E-02*	6.01E-03
VANADIUM	3.44E-01	NA	***6.13E+00***	**3.41E+00**	NA	NA	*5.19E-01*	2.88E-01	NA	NA	*5.19E-01*	2.88E-01	NA	NA
ZINC	6.61E+01	1.31E+02	*2.56E-01*	4.02E-02	*1.29E-01*	2.03E-02	*1.89E-01*	1.58E-01	*9.55E-02*	7.98E-02	*1.45E-01*	8.40E-02	*7.34E-02*	4.24E-02
PAHS														
TOTAL HMW PAH (ND = DL)	3.37E+00	3.37E+01	***3.12E+00***	7.08E-02	*3.12E-01*	7.08E-03	*1.20E-01*	2.95E-03	*1.20E-02*	2.95E-04	*1.14E-01*	2.69E-03	*1.14E-02*	2.69E-04
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***1.33E+01***	8.03E-02	***1.33E+00***	8.03E-03	***2.33E+00***	6.97E-03	*2.33E-01*	6.97E-04	***2.33E+00***	7.40E-03	*2.33E-01*	7.40E-04
PCBS														
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***3.41E+00***	3.22E-01	*3.41E-01*	3.22E-02	1.71E-01	2.60E-01	1.71E-02	2.60E-02	*6.29E-01*	5.30E-01	*6.29E-02*	5.30E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***3.94E+00***	4.70E-01	*3.94E-01*	4.70E-02	2.47E-01	3.32E-01	2.47E-02	3.32E-02	*6.52E-01*	5.53E-01	*6.52E-02*	5.53E-02
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 4.10
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO BIRDS (OSPREY) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
ND - Not detected in background.
NA = Not available
-- = Chemical not analyzed for
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.11
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO MAMMALS (RACCOON) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***3.69E+00***	**1.49E+00**	*3.69E-01*	1.49E-01	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	6.87E+01	NA	*8.36E-01*	NA	NA	NA	8.36E-01	NA	NA	NA	4.16E-03	NA	NA	NA
METALS														
ALUMINUM	1.93E+00	1.93E+01	***7.96E+01***	**6.47E+01**	***7.96E+00***	**6.47E+00**	***4.68E+01***	**3.74E+01**	***4.68E+00***	**3.74E+00**	**5.56E+01**	**6.54E+01**	**5.56E+00**	**6.54E+00**
ANTIMONY	5.90E-02	1.25E+00	***1.39E+00***	7.15E-01	*6.55E-02*	3.37E-02	6.42E-01	6.67E-01	3.03E-02	3.15E-02	***1.15E+00***	8.94E-01	*5.41E-02*	4.22E-02
ARSENIC	1.04E+00	1.26E+00	***2.78E+00***	6.26E-01	***2.30E+00***	5.17E-01	***1.05E+00***	8.76E-01	*8.65E-01*	7.23E-01	*6.94E-01*	5.83E-01	*5.73E-01*	4.81E-01
BERYLLIUM	5.32E-01	NA	*1.41E-02*	1.09E-02	NA	NA	*1.41E-02*	1.09E-02	NA	NA	*1.41E-02*	NA	NA	NA
CADMIUM	7.70E-01	1.00E+01	*8.67E-02*	1.80E-02	*6.68E-03*	1.39E-03	1.74E-01	2.02E-01	1.34E-02	1.56E-02	*3.40E-02*	7.06E-03	*2.62E-03*	5.44E-04
CHROMIUM	2.40E+00	1.31E+01	***1.38E+00***	6.18E-01	*2.52E-01*	1.13E-01	*7.74E-01*	3.55E-01	*1.41E-01*	6.48E-02	*8.16E-01*	5.12E-01	*1.49E-01*	9.35E-02
COBALT	7.33E+00	1.18E+02	*7.21E-02*	2.69E-02	*4.48E-03*	1.67E-03	*3.74E-02*	2.23E-02	*2.33E-03*	1.39E-03	*3.48E-02*	1.94E-02	*2.16E-03*	1.20E-03
COPPER	5.60E+00	1.54E+01	*9.21E-01*	1.63E-01	*3.35E-01*	5.91E-02	**1.88E+00**	**2.04E+00**	6.83E-01	7.41E-01	***4.50E+00***	**3.18E+00**	***1.64E+00***	**1.16E+00**
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	4.70E+00	8.00E+01	***1.60E+00***	1.51E-01	*9.38E-02*	8.87E-03	*9.51E-01*	9.39E-02	*5.59E-02*	5.52E-03	***1.04E+00***	1.47E-01	*6.10E-02*	8.63E-03
MANGANESE	5.15E+01	2.84E+02	*2.20E-01*	1.74E-01	*3.99E-02*	3.16E-02	*2.51E-01*	1.64E-01	*4.55E-02*	2.97E-02	2.99E-01	3.98E-01	5.43E-02	7.21E-02
MERCURY	1.32E+01	NA	*1.69E-03*	3.88E-04	NA	NA	*1.52E-03*	1.47E-03	NA	NA	2.19E-03	2.42E-03	NA	NA
NICKEL	1.70E+00	8.00E+01	*3.70E-01*	2.45E-01	*7.86E-03*	5.21E-03	*1.91E-01*	1.67E-01	*4.06E-03*	3.55E-03	*1.73E-01*	1.71E-01	*3.68E-03*	3.64E-03
SELENIUM	1.43E-01	3.30E-01	***3.37E+00***	6.66E-01	***1.46E+00***	2.88E-01	**5.42E+00**	**5.44E+00**	**2.35E+00**	**2.36E+00**	***8.87E+00***	**6.72E+00**	***3.84E+00***	**2.91E+00**
SILVER	6.02E+00	1.16E+02	*7.98E-03*	2.68E-03	*4.14E-04*	1.39E-04	*4.24E-02*	4.22E-02	*2.20E-03*	2.19E-03	*5.69E-02*	2.76E-02	*2.95E-03*	1.43E-03
THALLIUM	7.40E-03	7.40E-02	***1.70E+00***	4.87E-01	*1.70E-01*	4.87E-02	5.70E-01	9.12E-01	5.70E-02	9.12E-02	***1.32E+00***	1.30E-01	*1.32E-01*	1.30E-02
TIN	2.34E+01	3.50E+01	*7.83E-02*	1.51E-02	*5.24E-02*	1.01E-02	*3.04E-02*	1.35E-02	*2.03E-02*	9.03E-03	*3.72E-02*	1.40E-02	*2.49E-02*	9.38E-03
VANADIUM	4.16E+00	8.31E+00	***1.64E+00***	9.12E-01	NA	NA	*1.39E-01*	7.72E-02	NA	NA	*1.39E-01*	7.72E-02	NA	NA
ZINC	7.54E+01	3.20E+02	*7.25E-01*	1.14E-01	*1.71E-01*	2.69E-02	*5.37E-01*	4.49E-01	*1.27E-01*	1.06E-01	*4.13E-01*	2.39E-01	*9.72E-02*	5.62E-02
PAHS														
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***5.54E+01***	**1.26E+00**	***3.15E+00***	7.16E-02	***2.11E+00***	5.22E-02	*1.20E-01*	2.97E-03	***2.02E+00***	4.76E-02	*1.15E-01*	2.71E-03
TOTAL LMW PAH (ND = DL)	6.56E+01	4.34E+02	***2.21E+00***	1.32E-02	*3.34E-01*	2.00E-03	*3.87E-01*	1.02E-03	*5.86E-02*	1.54E-04	*3.87E-01*	1.09E-03	*5.85E-02*	1.65E-04
PCBS														
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***2.21E+02***	**2.08E+01**	***2.23E+01***	**2.11E+00**	**1.11E+01**	**1.68E+01**	**1.12E+00**	**1.70E+00**	***4.07E+01***	**3.43E+01**	***4.12E+00***	**3.47E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***2.55E+02***	**3.04E+01**	***2.58E+01***	**3.08E+00**	**1.60E+01**	**2.15E+01**	**1.62E+00**	**2.17E+00**	***4.23E+01***	**3.58E+01**	***4.27E+00***	**3.62E+00**

TABLE 4.11
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO MAMMALS (RACCOON) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	2.64E+01	2.64E+02	2.27E-03	NA	2.27E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	1.50E+01	4.10E+01	5.53E-06	NA	2.02E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	2.60E+01	2.60E+02	1.55E-03	NA	1.55E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	2.10E+00	2.60E+00	2.57E-04	NA	2.08E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
ND - Not detected in background.
NA = Not available
-- = Chemical not analyzed for
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.12
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO MAMMALS (RIVER OTTER) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***3.47E+00***	**1.40E+00**	3.47E-01	1.40E-01	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	6.87E+01	NA	7.86E-01	NA	NA	NA	7.86E-01	NA	NA	NA	3.91E-03	NA	NA	NA
METALS														
ALUMINUM	1.93E+00	1.93E+01	***7.49E+01***	**6.09E+01**	***7.49E+00***	**6.09E+00**	***4.40E+01***	**3.52E+01**	***4.40E+00***	**3.52E+00**	***5.23E+01***	**6.16E+01**	***5.23E+00***	**6.16E+00**
ANTIMONY	5.90E-02	1.25E+00	***1.31E+00***	6.73E-01	*6.16E-02*	3.17E-02	6.04E-01	6.28E-01	2.85E-02	2.96E-02	***1.08E+00***	8.41E-01	*5.10E-02*	3.97E-02
ARSENIC	1.04E+00	1.26E+00	***2.62E+00***	5.90E-01	***2.16E+00***	4.87E-01	*9.87E-01*	8.24E-01	*8.15E-01*	6.81E-01	*6.53E-01*	5.49E-01	*5.39E-01*	4.53E-01
BERYLLIUM	5.32E-01	NA	*1.32E-02*	1.02E-02	NA	NA	*1.32E-02*	1.02E-02	NA	NA	*1.32E-02*	NA	NA	NA
CADMIUM	7.70E-01	1.00E+01	*8.16E-02*	1.70E-02	*6.29E-03*	1.31E-03	1.64E-01	1.91E-01	1.26E-02	1.47E-02	*3.20E-02*	6.65E-03	*2.46E-03*	5.12E-04
CHROMIUM	2.40E+00	1.31E+01	***1.30E+00***	5.81E-01	*2.38E-01*	1.06E-01	*7.29E-01*	3.34E-01	*1.33E-01*	6.10E-02	*7.68E-01*	4.82E-01	*1.40E-01*	8.80E-02
COBALT	7.33E+00	1.18E+02	*6.79E-02*	2.54E-02	*4.22E-03*	1.58E-03	*3.52E-02*	2.10E-02	*2.19E-03*	1.30E-03	*3.27E-02*	1.83E-02	*2.03E-03*	1.13E-03
COPPER	5.60E+00	1.54E+01	*8.67E-01*	1.53E-01	*3.15E-01*	5.56E-02	***1.77E+00***	**1.92E+00**	6.42E-01	6.97E-01	***4.24E+00***	**3.00E+00**	***1.54E+00***	**1.09E+00**
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	4.70E+00	8.00E+01	***1.50E+00***	1.42E-01	*8.83E-02*	8.35E-03	*8.95E-01*	8.84E-02	*5.26E-02*	5.19E-03	*9.78E-01*	1.38E-01	*5.74E-02*	8.12E-03
MANGANESE	5.15E+01	2.84E+02	*2.07E-01*	1.64E-01	*3.76E-02*	2.97E-02	*2.36E-01*	1.54E-01	*4.28E-02*	2.79E-02	2.82E-01	3.74E-01	5.11E-02	6.79E-02
MERCURY	1.32E+01	NA	*1.59E-03*	3.66E-04	NA	NA	*1.43E-03*	1.39E-03	NA	NA	2.06E-03	2.28E-03	NA	NA
NICKEL	1.70E+00	8.00E+01	*3.48E-01*	2.31E-01	*7.40E-03*	4.91E-03	*1.80E-01*	1.57E-01	*3.82E-03*	3.34E-03	*1.63E-01*	1.61E-01	*3.46E-03*	3.42E-03
SELENIUM	1.43E-01	3.30E-01	***3.18E+00***	6.27E-01	***1.38E+00***	2.72E-01	***5.10E+00***	**5.12E+00**	***2.21E+00***	**2.22E+00**	***8.35E+00***	**6.33E+00**	***3.62E+00***	**2.74E+00**
SILVER	6.02E+00	1.16E+02	*7.51E-03*	2.52E-03	*3.90E-04*	1.31E-04	*3.99E-02*	3.97E-02	*2.07E-03*	2.06E-03	*5.36E-02*	2.60E-02	*2.78E-03*	1.35E-03
THALLIUM	7.40E-03	7.40E-02	***1.60E+00***	4.59E-01	*1.60E-01*	4.59E-02	5.37E-01	8.59E-01	5.37E-02	8.59E-02	***1.25E+00***	1.22E-01	*1.25E-01*	1.22E-02
TIN	2.34E+01	3.50E+01	*7.37E-02*	1.42E-02	*4.93E-02*	9.50E-03	*2.86E-02*	1.27E-02	*1.91E-02*	8.50E-03	*3.50E-02*	1.32E-02	*2.34E-02*	8.83E-03
VANADIUM	4.16E+00	8.31E+00	***1.55E+00***	8.58E-01	NA	NA	*1.31E-01*	7.27E-02	NA	NA	*1.31E-01*	7.27E-02	NA	NA
ZINC	7.54E+01	3.20E+02	*6.83E-01*	1.07E-01	*1.61E-01*	2.53E-02	*5.06E-01*	4.22E-01	*1.19E-01*	9.95E-02	*3.88E-01*	2.24E-01	*9.15E-02*	5.29E-02
PAHS														
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***5.21E+01***	**1.18E+00**	***2.97E+00***	6.74E-02	***1.99E+00***	4.91E-02	*1.13E-01*	2.80E-03	***1.90E+00***	4.48E-02	*1.08E-01*	2.55E-03
TOTAL LMW PAH (ND = DL)	6.56E+01	4.34E+02	***2.08E+00***	1.24E-02	*3.14E-01*	1.88E-03	*3.65E-01*	9.64E-04	*5.51E-02*	1.46E-04	*3.64E-01*	1.03E-03	*5.50E-02*	1.56E-04
PCBS														
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***2.08E+02***	**1.96E+01**	***2.10E+01***	**1.98E+00**	***1.04E+01***	**1.58E+01**	***1.05E+00***	**1.60E+00**	***3.83E+01***	**3.23E+01**	***3.88E+00***	**3.27E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***2.40E+02***	**2.86E+01**	***2.43E+01***	**2.90E+00**	***1.51E+01***	**2.02E+01**	***1.52E+00***	**2.05E+00**	***3.98E+01***	**3.37E+01**	***4.02E+00***	**3.41E+00**

TABLE 4.12
COMPARISON OF SCREENING LEVEL SCENARIO MODELED DOSES TO MAMMALS (RIVER OTTER) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	2.64E+01	2.64E+02	2.15E-03	NA	2.15E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	1.50E+01	4.10E+01	5.40E-06	NA	1.98E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	2.60E+01	2.60E+02	1.46E-03	NA	1.46E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	2.10E+00	2.60E+00	2.51E-04	NA	2.03E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
NA = Not available
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE 4.13
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO BIRDS (GREAT BLUE HERON) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.40E-05	1.40E-04	*6.41E-02*	5.94E-02	*6.41E-03*	5.94E-03	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
METALS														
ALUMINUM	1.10E+02	NA	*3.27E-01*	3.01E-01	NA	NA	*1.93E-01*	1.74E-01	NA	NA	2.30E-01	2.81E-01	NA	NA
ANTIMONY	5.10E+00	1.28E+01	1.83E-03	2.19E-03	7.29E-04	8.72E-04	1.45E-03	1.72E-03	5.77E-04	6.84E-04	*2.36E-03*	2.16E-03	*9.39E-04*	8.61E-04
ARSENIC	2.24E+00	7.40E+00	*1.31E-01*	5.09E-02	*3.97E-02*	1.54E-02	*1.09E-01*	1.06E-01	*3.30E-02*	3.21E-02	6.47E-02	6.88E-02	1.96E-02	2.08E-02
BERYLLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	1.45E+00	2.00E+01	*4.70E-03*	2.13E-03	*3.41E-04*	1.55E-04	2.06E-02	2.38E-02	1.49E-03	1.72E-03	*1.84E-03*	8.37E-04	*1.34E-04*	6.07E-05
CHROMIUM	2.66E+00	5.00E+00	*1.55E-01*	1.34E-01	*8.23E-02*	7.13E-02	*9.32E-02*	7.76E-02	*4.96E-02*	4.13E-02	1.00E-01	1.15E-01	5.34E-02	6.14E-02
COBALT	7.61E+00	2.67E+01	*1.02E-02*	6.87E-03	*2.90E-03*	1.96E-03	*6.45E-03*	5.25E-03	*1.84E-03*	1.50E-03	*5.81E-03*	4.87E-03	*1.66E-03*	1.39E-03
COPPER	4.05E+00	6.17E+01	*9.75E-02*	5.19E-02	*6.40E-03*	3.41E-03	5.15E-01	6.59E-01	3.38E-02	4.33E-02	***1.39E+00***	**1.04E+00**	*9.15E-02*	6.85E-02
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	1.63E+00	1.13E+01	*3.34E-01*	1.01E-01	*4.82E-02*	1.45E-02	*2.10E-01*	6.31E-02	*3.03E-02*	9.10E-03	*2.79E-01*	1.01E-01	*4.02E-02*	1.45E-02
MANGANESE	9.97E+02	NA	*2.40E-03*	2.38E-03	NA	NA	*2.73E-03*	2.11E-03	NA	NA	3.72E-03	4.83E-03	NA	NA
MERCURY	4.50E-01	9.00E-01	*5.31E-03*	1.76E-03	*2.65E-03*	8.79E-04	9.03E-03	9.92E-03	4.52E-03	4.96E-03	1.50E-02	1.57E-02	7.49E-03	7.87E-03
NICKEL	7.74E+01	1.07E+02	*1.63E-03*	9.37E-04	*1.18E-03*	6.78E-04	*9.38E-04*	7.83E-04	*6.78E-04*	5.66E-04	*8.17E-04*	8.11E-04	*5.91E-04*	5.87E-04
SELENIUM	2.90E-01	1.00E+00	*1.67E-01*	8.75E-02	*4.83E-02*	2.54E-02	6.38E-01	6.95E-01	1.85E-01	2.02E-01	***1.07E+00***	8.44E-01	*3.12E-01*	2.45E-01
SILVER	2.02E+00	6.05E+01	*3.11E-03*	1.93E-03	*1.04E-04*	6.44E-05	*2.98E-02*	2.84E-02	*9.94E-04*	9.50E-04	*3.75E-02*	1.79E-02	*1.25E-03*	5.97E-04
THALLIUM	3.50E-01	NA	*5.35E-03*	2.73E-03	NA	NA	2.08E-03	5.11E-03	NA	NA	*6.31E-03*	7.32E-04	NA	NA
TIN	6.80E+00	1.69E+01	*3.04E-02*	1.38E-02	*1.22E-02*	5.54E-03	*1.25E-02*	1.18E-02	*5.04E-03*	4.76E-03	*1.85E-02*	1.27E-02	*7.45E-03*	5.11E-03
VANADIUM	3.44E-01	NA	***3.59E+00***	**2.92E+00**	NA	NA	*3.04E-01*	2.47E-01	NA	NA	*3.04E-01*	2.47E-01	NA	NA
ZINC	6.61E+01	1.31E+02	*8.02E-02*	3.02E-02	*4.05E-02*	1.52E-02	*1.39E-01*	1.33E-01	*6.99E-02*	6.71E-02	*9.83E-02*	7.08E-02	*4.96E-02*	3.57E-02
PAHS														
TOTAL HMW PAH (ND = DL)	3.37E+00	3.37E+01	*6.55E-01*	5.96E-02	*6.55E-02*	5.96E-03	*2.83E-02*	2.50E-03	*2.83E-03*	2.50E-04	*2.42E-02*	2.28E-03	*2.42E-03*	2.28E-04
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***3.25E+00***	6.76E-02	*3.25E-01*	6.76E-03	*6.01E-01*	5.60E-03	*6.01E-02*	5.60E-04	*5.98E-01*	6.04E-03	*5.98E-02*	6.04E-04
PCBS														
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***1.14E+00***	2.50E-01	*1.14E-01*	2.50E-02	1.38E-01	2.08E-01	1.38E-02	2.08E-02	*5.21E-01*	4.54E-01	*5.21E-02*	4.54E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***1.83E+00***	3.68E-01	*1.83E-01*	3.68E-02	2.00E-01	2.72E-01	2.00E-02	2.72E-02	*5.42E-01*	4.74E-01	*5.42E-02*	4.74E-02

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
ND - Not detected in background.
NA = Not available
-- = Chemical not analyzed for
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.14
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO BIRDS (OSPREY) TO AVIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Avian TRVs (mg/kg-bw day)		Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.40E-05	1.40E-04	*7.48E-02*	6.93E-02	*7.48E-03*	6.93E-03	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
METALS														
ALUMINUM	1.10E+02	NA	*3.82E-01*	3.51E-01	NA	NA	*2.25E-01*	2.03E-01	NA	NA	2.69E-01	3.28E-01	NA	NA
ANTIMONY	5.10E+00	1.28E+01	2.13E-03	2.55E-03	8.50E-04	1.02E-03	1.69E-03	2.00E-03	6.74E-04	7.98E-04	*2.75E-03*	2.52E-03	*1.10E-03*	1.00E-03
ARSENIC	2.24E+00	7.40E+00	*1.53E-01*	5.94E-02	*4.64E-02*	1.80E-02	*1.27E-01*	1.24E-01	*3.85E-02*	3.74E-02	7.55E-02	8.03E-02	2.28E-02	2.43E-02
BERYLLIUM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	1.45E+00	2.00E+01	*5.48E-03*	2.49E-03	*3.97E-04*	1.81E-04	2.40E-02	2.77E-02	1.74E-03	2.01E-03	*2.15E-03*	9.76E-04	*1.56E-04*	7.08E-05
CHROMIUM	2.66E+00	5.00E+00	*1.81E-01*	1.56E-01	*9.61E-02*	8.32E-02	*1.09E-01*	9.05E-02	*5.79E-02*	4.82E-02	1.17E-01	1.35E-01	6.23E-02	7.16E-02
COBALT	7.61E+00	2.67E+01	*1.19E-02*	8.02E-03	*3.39E-03*	2.28E-03	*7.52E-03*	6.13E-03	*2.14E-03*	1.75E-03	*6.78E-03*	5.68E-03	*1.93E-03*	1.62E-03
COPPER	4.05E+00	6.17E+01	*1.14E-01*	6.06E-02	*7.47E-03*	3.98E-03	6.01E-01	7.69E-01	3.95E-02	5.05E-02	***1.63E+00***	**1.22E+00**	*1.07E-01*	7.99E-02
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	1.63E+00	1.13E+01	*3.89E-01*	1.17E-01	*5.62E-02*	1.69E-02	*2.45E-01*	7.36E-02	*3.54E-02*	1.06E-02	*3.25E-01*	1.17E-01	*4.70E-02*	1.69E-02
MANGANESE	9.97E+02	NA	*2.80E-03*	2.78E-03	NA	NA	*3.19E-03*	2.47E-03	NA	NA	4.34E-03	5.63E-03	NA	NA
MERCURY	4.50E-01	9.00E-01	*6.19E-03*	2.05E-03	*3.10E-03*	1.03E-03	1.05E-02	1.16E-02	5.27E-03	5.78E-03	1.75E-02	1.84E-02	8.74E-03	9.18E-03
NICKEL	7.74E+01	1.07E+02	*1.90E-03*	1.09E-03	*1.37E-03*	7.91E-04	*1.09E-03*	9.13E-04	*7.91E-04*	6.60E-04	*9.53E-04*	9.46E-04	*6.89E-04*	6.84E-04
SELENIUM	2.90E-01	1.00E+00	*1.94E-01*	1.02E-01	*5.64E-02*	2.96E-02	7.45E-01	8.11E-01	2.16E-01	2.35E-01	***1.25E+00***	9.85E-01	*3.64E-01*	2.86E-01
SILVER	2.02E+00	6.05E+01	*3.63E-03*	2.25E-03	*1.21E-04*	7.51E-05	*3.47E-02*	3.32E-02	*1.16E-03*	1.11E-03	*4.37E-02*	2.09E-02	*1.46E-03*	6.97E-04
THALLIUM	3.50E-01	NA	*6.24E-03*	3.19E-03	NA	NA	2.43E-03	5.96E-03	NA	NA	*7.36E-03*	8.54E-04	NA	NA
TIN	6.80E+00	1.69E+01	*3.55E-02*	1.61E-02	*1.43E-02*	6.46E-03	*1.46E-02*	1.38E-02	*5.88E-03*	5.55E-03	*2.16E-02*	1.48E-02	*8.69E-03*	5.96E-03
VANADIUM	3.44E-01	NA	***4.19E+00***	**3.41E+00**	NA	NA	*3.55E-01*	2.88E-01	NA	NA	*3.55E-01*	2.88E-01	NA	NA
ZINC	6.61E+01	1.31E+02	*9.36E-02*	3.52E-02	*4.72E-02*	1.78E-02	*1.62E-01*	1.55E-01	*8.16E-02*	7.82E-02	*1.15E-01*	8.26E-02	*5.79E-02*	4.17E-02
PAHS														
TOTAL HMW PAH (ND = DL)	3.37E+00	3.37E+01	*7.64E-01*	6.96E-02	*7.64E-02*	6.96E-03	*3.30E-02*	2.91E-03	*3.30E-03*	2.91E-04	*2.82E-02*	2.66E-03	*2.82E-03*	2.66E-04
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***3.79E+00***	7.89E-02	*3.79E-01*	7.89E-03	*7.01E-01*	6.52E-03	*7.01E-02*	6.52E-04	*6.97E-01*	7.03E-03	*6.97E-02*	7.03E-04
PCBS														
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***1.33E+00***	2.92E-01	*1.33E-01*	2.92E-02	1.61E-01	2.43E-01	1.61E-02	2.43E-02	*6.08E-01*	5.30E-01	*6.08E-02*	5.30E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***2.14E+00***	4.29E-01	*2.14E-01*	4.29E-02	2.34E-01	3.18E-01	2.34E-02	3.18E-02	*6.32E-01*	5.53E-01	*6.32E-02*	5.53E-02

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
NA = Not available
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.15
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (RACCOON) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.46E+00***	**1.40E+00**	1.46E-01	1.40E-01	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	6.87E+01	NA	3.35E-01	NA	NA	NA	*3.35E-01*	NA	NA	NA	1.67E-03	NA	NA	NA
METALS														
ALUMINUM	1.93E+00	1.93E+01	***7.03E+01***	**6.47E+01**	***7.03E+00***	**6.47E+00**	***4.13E+01***	**3.73E+01**	***4.13E+00***	**3.73E+00**	**4.94E+01**	**6.04E+01**	**4.94E+00**	**6.04E+00**
ANTIMONY	5.90E-02	1.25E+00	5.97E-01	7.15E-01	2.82E-02	3.37E-02	4.73E-01	5.60E-01	2.23E-02	2.65E-02	*7.69E-01*	7.05E-01	*3.63E-02*	3.33E-02
ARSENIC	1.04E+00	1.26E+00	***1.07E+00***	4.14E-01	*8.82E-01*	3.42E-01	*8.86E-01*	8.62E-01	*7.31E-01*	7.11E-01	5.26E-01	5.60E-01	4.34E-01	4.62E-01
BERYLLIUM	5.32E-01	NA	1.06E-02	1.09E-02	NA	NA	1.06E-02	1.09E-02	NA	NA	1.06E-02	NA	NA	NA
CADMIUM	7.70E-01	1.00E+01	*3.34E-02*	1.52E-02	*2.57E-03*	1.17E-03	1.46E-01	1.69E-01	1.13E-02	1.30E-02	*1.31E-02*	5.95E-03	*1.01E-03*	4.58E-04
CHROMIUM	2.40E+00	1.31E+01	*6.48E-01*	5.61E-01	*1.18E-01*	1.02E-01	*3.90E-01*	3.24E-01	*7.13E-02*	5.92E-02	4.20E-01	4.83E-01	7.67E-02	8.81E-02
COBALT	7.33E+00	1.18E+02	*3.99E-02*	2.69E-02	*2.48E-03*	1.67E-03	*2.53E-02*	2.06E-02	*1.57E-03*	1.28E-03	*2.28E-02*	1.91E-02	*1.42E-03*	1.19E-03
COPPER	5.60E+00	1.54E+01	*2.66E-01*	1.42E-01	*9.68E-02*	5.16E-02	**1.41E+00**	**1.80E+00**	5.12E-01	6.55E-01	***3.81E+00***	**2.85E+00**	***1.38E+00***	**1.04E+00**
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	4.70E+00	8.00E+01	*4.37E-01*	1.32E-01	*2.57E-02*	7.75E-03	*2.75E-01*	8.27E-02	*1.62E-02*	4.86E-03	*3.66E-01*	1.32E-01	*2.15E-02*	7.74E-03
MANGANESE	5.15E+01	2.84E+02	*1.76E-01*	1.74E-01	*3.18E-02*	3.16E-02	*2.00E-01*	1.54E-01	*3.62E-02*	2.80E-02	2.72E-01	3.53E-01	4.93E-02	6.40E-02
MERCURY	1.32E+01	NA	*6.83E-04*	2.26E-04	NA	NA	1.16E-03	1.28E-03	NA	NA	1.93E-03	2.03E-03	NA	NA
NICKEL	1.70E+00	8.00E+01	*2.80E-01*	1.61E-01	*5.95E-03*	3.42E-03	*1.61E-01*	1.34E-01	*3.42E-03*	2.85E-03	*1.40E-01*	1.39E-01	*2.98E-03*	2.96E-03
SELENIUM	1.43E-01	3.30E-01	**1.27E+00**	6.63E-01	*5.50E-01*	2.87E-01	**4.88E+00**	**5.32E+00**	**2.12E+00**	**2.30E+00**	***8.22E+00***	**6.46E+00**	***3.56E+00***	**2.80E+00**
SILVER	6.02E+00	1.16E+02	*3.95E-03*	2.45E-03	*2.05E-04*	1.27E-04	*3.77E-02*	3.61E-02	*1.96E-03*	1.87E-03	*4.75E-02*	2.27E-02	*2.47E-03*	1.18E-03
THALLIUM	7.40E-03	7.40E-02	*9.56E-01*	4.87E-01	*9.56E-02*	4.87E-02	3.72E-01	9.12E-01	3.72E-02	9.12E-02	***1.13E+00***	1.30E-01	*1.13E-01*	1.30E-02
TIN	2.34E+01	3.50E+01	*3.34E-02*	1.51E-02	*2.23E-02*	1.01E-02	*1.38E-02*	1.30E-02	*9.19E-03*	8.67E-03	*2.03E-02*	1.39E-02	*1.36E-02*	9.31E-03
VANADIUM	4.16E+00	8.31E+00	***1.12E+00***	9.12E-01	NA	NA	*9.50E-02*	7.72E-02	NA	NA	*9.50E-02*	7.72E-02	NA	NA
ZINC	7.54E+01	3.20E+02	*2.66E-01*	9.99E-02	*6.26E-02*	2.35E-02	*4.59E-01*	4.40E-01	*1.08E-01*	1.04E-01	*3.26E-01*	2.34E-01	*7.67E-02*	5.53E-02
PAHS														
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***1.35E+01***	**1.23E+00**	*7.71E-01*	7.03E-02	*5.85E-01*	5.16E-02	*3.33E-02*	2.94E-03	*5.00E-01*	4.70E-02	*2.85E-02*	2.68E-03
TOTAL LMW PAH (ND = DL)	6.56E+01	4.34E+02	*6.31E-01*	1.30E-02	*9.53E-02*	1.97E-03	*1.17E-01*	9.72E-04	*1.76E-02*	1.47E-04	*1.16E-01*	1.06E-03	*1.75E-02*	1.60E-04
PCBS														
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***8.64E+01***	**1.89E+01**	***8.74E+00***	**1.91E+00**	**1.04E+01**	**1.57E+01**	**1.05E+00**	**1.59E+00**	***3.94E+01***	**3.43E+01**	***3.98E+00***	**3.47E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.38E+02***	**2.78E+01**	***1.40E+01***	**2.81E+00**	**1.51E+01**	**2.06E+01**	**1.53E+00**	**2.08E+00**	***4.09E+01***	**3.58E+01**	***4.14E+00***	**3.62E+00**

TABLE 4.15
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (RACCOON) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	2.64E+01	2.64E+02	2.09E-03	NA	2.09E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	1.50E+01	4.10E+01	5.53E-06	NA	2.02E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	2.60E+01	2.60E+02	1.51E-03	NA	1.51E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	2.10E+00	2.60E+00	1.75E-04	NA	1.42E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
NA = Not available
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.16
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (RIVER OTTER) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
DIOXINS														
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.37E+00***	**1.31E+00**	1.37E-01	1.31E-01	NA	NA	NA	NA	NA	NA	NA	NA
INORGANICS														
CYANIDE (TOTAL)	6.87E+01	NA	3.15E-01	NA	NA	NA	3.15E-01	NA	NA	NA	1.57E-03	NA	NA	NA
METALS														
ALUMINUM	1.93E+00	1.93E+01	***6.62E+01***	**6.09E+01**	***6.62E+00***	**6.09E+00**	***3.89E+01***	**3.51E+01**	***3.89E+00***	**3.51E+00**	***4.65E+01***	**5.68E+01**	***4.65E+00***	**5.68E+00**
ANTIMONY	5.90E-02	1.25E+00	5.62E-01	6.73E-01	2.65E-02	3.17E-02	4.45E-01	5.27E-01	2.10E-02	2.49E-02	*7.24E-01*	6.64E-01	*3.42E-02*	3.13E-02
ARSENIC	1.04E+00	1.26E+00	***1.01E+00***	3.90E-01	*8.30E-01*	3.22E-01	*8.33E-01*	8.11E-01	*6.88E-01*	6.69E-01	4.95E-01	5.27E-01	4.09E-01	4.35E-01
BERYLLIUM	5.32E-01	NA	9.99E-03	1.02E-02	NA	NA	9.99E-03	1.02E-02	NA	NA	9.99E-03	NA	NA	NA
CADMIUM	7.70E-01	1.00E+01	*3.15E-02*	1.43E-02	*2.42E-03*	1.10E-03	1.38E-01	1.59E-01	1.06E-02	1.22E-02	*1.23E-02*	5.60E-03	*9.49E-04*	4.31E-04
CHROMIUM	2.40E+00	1.31E+01	*6.10E-01*	5.28E-01	*1.11E-01*	9.64E-02	*3.67E-01*	3.05E-01	*6.71E-02*	5.58E-02	3.95E-01	4.54E-01	7.22E-02	8.30E-02
COBALT	7.33E+00	1.18E+02	*3.76E-02*	2.54E-02	*2.33E-03*	1.58E-03	*2.38E-02*	1.94E-02	*1.48E-03*	1.20E-03	*2.15E-02*	1.80E-02	*1.33E-03*	1.12E-03
COPPER	5.60E+00	1.54E+01	*2.51E-01*	1.34E-01	*9.11E-02*	4.85E-02	***1.32E+00***	**1.70E+00**	4.82E-01	6.16E-01	***3.58E+00***	**2.68E+00**	***1.30E+00***	9.76E-01
IRON	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	4.70E+00	8.00E+01	*4.12E-01*	1.24E-01	*2.42E-02*	7.29E-03	*2.59E-01*	7.78E-02	*1.52E-02*	4.57E-03	*3.44E-01*	1.24E-01	*2.02E-02*	7.29E-03
MANGANESE	5.15E+01	2.84E+02	*1.65E-01*	1.64E-01	*3.00E-02*	2.97E-02	*1.88E-01*	1.45E-01	*3.41E-02*	2.64E-02	2.56E-01	3.32E-01	4.64E-02	6.02E-02
MERCURY	1.32E+01	NA	*6.43E-04*	2.13E-04	NA	NA	1.09E-03	1.20E-03	NA	NA	1.82E-03	1.91E-03	NA	NA
NICKEL	1.70E+00	8.00E+01	*2.63E-01*	1.51E-01	*5.60E-03*	3.22E-03	*1.51E-01*	1.26E-01	*3.22E-03*	2.69E-03	*1.32E-01*	1.31E-01	*2.80E-03*	2.78E-03
SELENIUM	1.43E-01	3.30E-01	***1.19E+00***	6.24E-01	*5.17E-01*	2.70E-01	***4.60E+00***	**5.00E+00**	***1.99E+00***	**2.17E+00**	***7.74E+00***	**6.08E+00**	***3.35E+00***	**2.64E+00**
SILVER	6.02E+00	1.16E+02	*3.72E-03*	2.30E-03	*1.93E-04*	1.19E-04	*3.55E-02*	3.39E-02	*1.84E-03*	1.76E-03	*4.47E-02*	2.13E-02	*2.32E-03*	1.11E-03
THALLIUM	7.40E-03	7.40E-02	*8.99E-01*	4.59E-01	*8.99E-02*	4.59E-02	***3.50E-01***	8.59E-01	3.50E-02	8.59E-02	***1.06E+00***	1.22E-01	*1.06E-01*	1.22E-02
TIN	2.34E+01	3.50E+01	*3.14E-02*	1.42E-02	*2.10E-02*	9.50E-03	*1.29E-02*	1.22E-02	*8.65E-03*	8.16E-03	*1.91E-02*	1.31E-02	*1.28E-02*	8.77E-03
VANADIUM	4.16E+00	8.31E+00	***1.06E+00***	8.58E-01	NA	NA	*8.94E-02*	7.26E-02	NA	NA	*8.94E-02*	7.26E-02	NA	NA
ZINC	7.54E+01	3.20E+02	*2.50E-01*	9.40E-02	*5.89E-02*	2.22E-02	*4.32E-01*	4.14E-01	*1.02E-01*	9.76E-02	*3.06E-01*	2.21E-01	*7.22E-02*	5.20E-02
PAHS														
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***1.28E+01***	**1.16E+00**	*7.26E-01*	6.62E-02	*5.51E-01*	4.85E-02	*3.14E-02*	2.76E-03	*4.70E-01*	4.42E-02	*2.68E-02*	2.52E-03
TOTAL LMW PAH (ND = DL)	6.56E+01	4.34E+02	*5.94E-01*	1.22E-02	*8.97E-02*	1.85E-03	*1.10E-01*	9.18E-04	*1.66E-02*	1.39E-04	*1.09E-01*	9.99E-04	*1.65E-02*	1.51E-04
PCBS														
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***8.13E+01***	**1.78E+01**	***8.22E+00***	**1.80E+00**	***9.80E+00***	**1.48E+01**	9.91E-01	**1.50E+00**	***3.71E+01***	**3.23E+01**	***3.75E+00***	**3.27E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.30E+02***	**2.61E+01**	***1.32E+01***	**2.64E+00**	***1.43E+01***	**1.94E+01**	***1.44E+00***	**1.96E+00**	***3.85E+01***	**3.37E+01**	***3.89E+00***	**3.41E+00**

TABLE 4.16
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (RIVER OTTER) TO MAMMALIAN TRVS FOR THE COKE POINT OFFSHORE AREA GROUPING*

Chemical	Mammalian TRVs (mg/kg bw day)		Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water				Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water			
	NOAEL	LOAEL	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ	Coke Point NOAEL HQ	Background NOAEL HQ	Coke Point LOAEL HQ	Background LOAEL HQ
ORGANOTINS														
TRIBUTYLTIN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES														
1,2-DICHLOROBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	2.64E+01	2.64E+02	1.97E-03	NA	1.97E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	1.50E+01	4.10E+01	5.40E-06	NA	1.98E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	2.60E+01	2.60E+02	1.42E-03	NA	1.42E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL XYLENES	2.10E+00	2.60E+00	1.71E-04	NA	1.38E-04	NA	NA	NA	NA	NA	NA	NA	NA	NA

Italics = Value is greater than background (shown in the NOAEL/LOAEL HQ columns).
Bold = HQ value greater than one
Bold & Italics = HQ value greater than one and exceeds background.
NA = Not available
*Notes:
1) TEQ maximum (screening level scenario) and mean (reasonable maximum scenario) EPC values were calculated by multiplying individual dioxin congener concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.
2) Low molecular weight (LMW) PAH compounds share similar modes of toxicity, and it is appropriate to examine exposures to these compounds as a whole for some ecological receptors. Therefore, concentrations for individual LMW PAHs were summed. High molecular weight (HMW) PAHs show the same properties and are similarly summed.
3) PCBs and dioxins were not measured in surface water based on expected fate and transport characteristic for these compounds. Therefore, food web exposures based on surface water are not presented in this table.
4) Dioxins and VOCs were not analyzed for in crab and fish tissue; therefore the same uptake and exposure assumptions (e.g. sedBAFs) were used for crab and fish ingestion scenarios as were used for ingestion of benthos. Therefore, results are not repeated.

TABLE 4.17
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO BIRDS (HERON) TO AVIAN TRVS WITH CONSIDERATION OF HERON AREA USE FACTORS

Chemical	Avian TRVs (mg/kg-bw day)		Reasonable Maximum NOAEL HQs			Reasonable Maximum LOAEL HQs		
	NOAEL	LOAEL	HQ Based on Constant Use of Coke Point/Small Home Range AUF:	HQ Based on Large Home Range AUF:	Background Risk AUF:	HQ Based on Constant Use of Coke Point/Small Home Range AUF:	HQ Based on Large Home Range AUF:	Background Risk AUF:
			100%	10%	0%	100%	10%	0%
Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water								
METALS								
VANADIUM	3.44E-01	NA	***3.59E+00***	***2.99E+00***	**2.92E+00**	NA	NA	NA
PAHS								
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***3.25E+00***	3.86E-01	6.76E-02	*3.25E-01*	*3.86E-02*	6.76E-03
PCBS								
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***1.14E+00***	3.40E-01	2.50E-01	*1.14E-01*	*3.40E-02*	2.50E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***1.83E+00***	5.14E-01	3.68E-01	*1.83E-01*	*5.14E-02*	3.68E-02
Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water								
METALS								
COPPER	4.05E+00	6.17E+01	***1.39E+00***	***1.08E+00***	**1.04E+00**	*9.15E-02*	*7.08E-02*	6.85E-02
SELENIUM	2.90E-01	1.00E+00	***1.07E+00***	8.67E-01	8.44E-01	*3.12E-01*	*2.52E-01*	2.45E-01

Italics = Dose from Coke Point greater than dose from background.
Bold = HQ greater than one.
Bold and italics = Dose from Coke Point greater than dose from background and HQ greater than one.

TABLE 4.18
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO BIRDS (OSPREY) TO AVIAN TRVS WITH CONSIDERATION OF OSPREY AREA USE FACTORS

Chemical	Avian TRVs (mg/kg-bw day)		Reasonable Maximum NOAEL HQs				Reasonable Maximum LOAEL HQs			
	NOAEL	LOAEL	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 68%	HQ Based on Large Home Range AUF: 25%	Background Risk AUF: 0%	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 68%	HQ Based on Large Home Range AUF: 25%	Background Risk AUF: 0%
Piscivorous Bird Exposures via Ingestion of Sediment, Benthos, and Surface Water										
METALS										
VANADIUM	3.44E-01	NA	***4.19E+00***	***3.94E+00***	***3.60E+00***	**3.41E+00**	NA	NA	NA	NA
PAHS										
TOTAL LMW PAH (ND = DL)	3.37E+00	3.37E+01	***3.79E+00***	***2.60E+00***	***1.01E+00***	7.89E-02	*3.79E-01*	2.60E-01	*1.01E-01*	7.89E-03
PCBS										
TOTAL PCBS (ND = 0)	1.80E-01	1.80E+00	***1.33E+00***	***1.00E+00***	5.52E-01	2.92E-01	*1.33E-01*	1.00E-01	*5.52E-02*	2.92E-02
TOTAL PCBS (ND = DL)	1.80E-01	1.80E+00	***2.14E+00***	***1.59E+00***	8.56E-01	4.29E-01	*2.14E-01*	1.59E-01	*8.56E-02*	4.29E-02
Piscivorous Bird Exposures via Ingestion of Sediment, Fish, and Surface Water										
METALS										
COPPER	4.05E+00	6.17E+01	***1.63E+00***	***1.50E+00***	***1.32E+00***	**1.22E+00**	*1.07E-01*	9.81E-02	*8.66E-02*	7.99E-02
SELENIUM	2.90E-01	1.00E+00	***1.25E+00***	***1.17E+00***	***1.05E+00***	9.85E-01	*3.64E-01*	3.39E-01	*3.05E-01*	2.86E-01

Italics = Dose from Coke Point greater than dose from background.
Bold = HQ greater than one.
Bold and italics = Dose from Coke Point greater than dose from background and HQ greater than one.

TABLE 4.19
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (RACCOON) TO MAMMALIAN TRVS WITH CONSIDERATION OF RACCOON AREA USE FACTORS

Chemical	Mammalian TRVs (mg/kg-bw day)		Reasonable Maximum NOAEL HQs				Reasonable Maximum LOAEL HQs			
	NOAEL	LOAEL	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 50%	HQ Based on Large Home Range AUF: 10%	Background Risk AUF: 0%	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 50%	HQ Based on Large Home Range AUF: 10%	Background Risk AUF: 0%
Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water										
DIOXINS										
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.46E+00***	***1.43E+00***	***1.40E+00***	**1.40E+00**	*1.46E-01*	1.43E-01	1.40E-01	1.40E-01
METALS										
ALUMINUM	1.93E+00	1.93E+01	***7.03E+01***	***6.75E+01***	***6.52E+01***	**6.47E+01**	***7.03E+00***	***6.75E+00***	***6.52E+00***	**6.47E+00**
ARSENIC	1.04E+00	1.26E+00	***1.07E+00***	7.41E-01	4.80E-01	4.14E-01	*8.82E-01*	6.12E-01	*3.96E-01*	3.42E-01
COPPER	5.60E+00	1.54E+01	*2.66E-01*	2.04E-01	1.54E-01	1.42E-01	*9.68E-02*	7.42E-02	*5.61E-02*	5.16E-02
SELENIUM	1.43E-01	3.30E-01	***1.27E+00***	9.66E-01	7.23E-01	6.63E-01	*5.50E-01*	4.18E-01	*3.14E-01*	2.87E-01
VANADIUM	4.16E+00	8.31E+00	***1.12E+00***	***1.02E+00***	9.33E-01	9.12E-01	*5.62E-01*	5.09E-01	*4.67E-01*	4.56E-01
PAHS										
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***1.35E+01***	***7.39E+00***	***2.47E+00***	**1.23E+00**	*7.71E-01*	4.21E-01	*1.40E-01*	7.03E-02
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***8.64E+01***	***5.26E+01***	***2.57E+01***	**1.89E+01**	***8.74E+00***	***5.32E+00***	***2.59E+00***	**1.91E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.38E+02***	***8.31E+01***	***3.88E+01***	**2.78E+01**	***1.40E+01***	***8.40E+00***	***3.93E+00***	**2.81E+00**
Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water										
DIOXINS										
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.46E+00***	***1.43E+00***	***1.40E+00***	**1.40E+00**	*1.46E-01*	1.43E-01	*1.40E-01*	1.40E-01
METALS										
ALUMINUM	1.93E+00	1.93E+01	***4.13E+01***	***3.93E+01***	***3.77E+01***	**3.73E+01**	***4.13E+00***	***3.93E+00***	***3.77E+00***	**3.73E+00**
COPPER	5.60E+00	1.54E+01	***1.41E+00***	***1.60E+00***	***1.76E+00***	**1.80E+00**	5.12E-01	5.83E-01	*6.41E-01*	6.55E-01
SELENIUM	1.43E-01	3.30E-01	***4.88E+00***	***5.10E+00***	***5.27E+00***	**5.32E+00**	***2.12E+00***	***2.21E+00***	***2.28E+00***	**2.30E+00**
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***1.04E+01***	***1.31E+01***	***1.52E+01***	**1.57E+01**	***1.05E+00***	***1.32E+00***	***1.54E+00***	**1.59E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.51E+01***	***1.79E+01***	***2.00E+01***	**2.06E+01**	***1.53E+00***	***1.81E+00***	***2.03E+00***	**2.08E+00**
Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water										
METALS										
ALUMINUM	1.93E+00	1.93E+01	***4.94E+01***	***5.49E+01***	***5.93E+01***	**6.04E+01**	***4.94E+00***	***5.49E+00***	***5.93E+00***	**6.04E+00**
COPPER	5.60E+00	1.54E+01	***3.81E+00***	***3.33E+00***	***2.95E+00***	**2.85E+00**	***1.38E+00***	***1.21E+00***	***1.07E+00***	**1.04E+00**
SELENIUM	1.43E-01	3.30E-01	***8.22E+00***	***7.34E+00***	***6.64E+00***	**6.46E+00**	***3.56E+00***	***3.18E+00***	***2.88E+00***	**2.80E+00**
THALLIUM	7.40E-03	7.40E-02	***1.13E+00***	6.28E-01	2.29E-01	1.30E-01	*1.13E-01*	6.28E-02	*2.29E-02*	1.30E-02
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***3.94E+01***	***3.68E+01***	***3.48E+01***	**3.43E+01**	***3.98E+00***	***3.73E+00***	***3.52E+00***	**3.47E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***4.09E+01***	***3.84E+01***	***3.63E+01***	**3.58E+01**	***4.14E+00***	***3.88E+00***	***3.68E+00***	**3.62E+00**

Italics = Dose from Coke Point greater than dose from background.
Bold = HQ greater than one.
Bold and italics = Dose from Coke Point greater than dose from background and HQ greater than one.

TABLE 4.20
COMPARISON OF REASONABLE MAXIMUM SCENARIO MODELED DOSES TO MAMMALS (OTTER) TO MAMMALIAN TRVS WITH CONSIDERATION OF OTTER AREA USE FACTORS

Chemical	Mammalian TRVs (mg/kg-bw day)		Reasonable Maximum NOAEL HQs				Reasonable Maximum LOAEL HQs			
	NOAEL	LOAEL	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 50%	HQ Based on Large Home Range AUF: 10%	Background Risk AUF: 0%	HQ Based on Constant Use of Coke Point AUF: 100%	HQ Based on Small Home Range AUF: 50%	HQ Based on Large Home Range AUF: 10%	Background Risk AUF: 0%
Piscivorous Mammal Exposures via Ingestion of Sediment, Benthos, and Surface Water										
DIOXINS										
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.37E+00***	***1.34E+00***	***1.32E+00***	**1.31E+00**	*1.37E-01*	1.34E-01	1.32E-01	1.31E-01
METALS										
ALUMINUM	1.93E+00	1.93E+01	***6.62E+01***	***6.35E+01***	***6.14E+01***	**6.09E+01**	***6.62E+00***	***6.35E+00***	***6.14E+00***	**6.09E+00**
ARSENIC	1.04E+00	1.26E+00	***1.01E+00***	6.98E-01	4.51E-01	3.90E-01	*8.30E-01*	5.76E-01	*3.73E-01*	3.22E-01
SELENIUM	1.43E-01	3.30E-01	***1.19E+00***	9.09E-01	6.81E-01	6.24E-01	*5.17E-01*	3.94E-01	*2.95E-01*	2.70E-01
VANADIUM	4.16E+00	8.31E+00	***1.06E+00***	9.57E-01	8.78E-01	8.58E-01	*5.29E-01*	4.79E-01	*4.39E-01*	4.30E-01
PAHS										
TOTAL HMW PAH (ND = DL)	6.15E-01	1.08E+01	***1.28E+01***	***6.96E+00***	***2.32E+00***	**1.16E+00**	*7.26E-01*	3.96E-01	*1.32E-01*	6.62E-02
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***8.13E+01***	***4.96E+01***	***2.41E+01***	**1.78E+01**	***8.22E+00***	***5.01E+00***	***2.44E+00***	**1.80E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.30E+02***	***7.82E+01***	***3.65E+01***	**2.61E+01**	***1.32E+01***	***7.90E+00***	***3.70E+00***	**2.64E+00**
Piscivorous Mammal Exposures via Ingestion of Sediment, Crab, and Surface Water										
DIOXINS										
TCDD TEQ (ND = DL)	1.00E-06	1.00E-05	***1.37E+00***	***1.34E+00***	***1.32E+00***	**1.31E+00**	*1.37E-01*	1.34E-01	*1.32E-01*	1.31E-01
METALS										
ALUMINUM	1.93E+00	1.93E+01	***3.89E+01***	***3.70E+01***	***3.55E+01***	**3.51E+01**	***3.89E+00***	***3.70E+00***	***3.55E+00***	**3.51E+00**
COPPER	5.60E+00	1.54E+01	***1.32E+00***	***1.51E+00***	***1.66E+00***	**1.70E+00**	4.82E-01	5.49E-01	*6.03E-01*	6.16E-01
SELENIUM	1.43E-01	3.30E-01	***4.60E+00***	***4.80E+00***	***4.96E+00***	**5.00E+00**	***1.99E+00***	***2.08E+00***	***2.15E+00***	**2.17E+00**
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***9.80E+00***	***7.33E+00***	***5.35E+00***	**4.86E+00**	*9.91E-01*	7.41E-01	*5.41E-01*	4.91E-01
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***1.43E+01***	***1.03E+01***	***7.15E+00***	**6.36E+00**	***1.44E+00***	***1.04E+00***	*7.23E-01*	6.43E-01
Piscivorous Mammal Exposures via Ingestion of Sediment, Fish, and Surface Water										
METALS										
ALUMINUM	1.93E+00	1.93E+01	***4.65E+01***	***5.17E+01***	***5.58E+01***	**5.68E+01**	***4.65E+00***	***5.17E+00***	***5.58E+00***	**5.68E+00**
COPPER	5.60E+00	1.54E+01	***3.58E+00***	***3.13E+00***	***2.77E+00***	**2.68E+00**	***1.30E+00***	***1.14E+00***	***1.01E+00***	9.76E-01
SELENIUM	1.43E-01	3.30E-01	***7.74E+00***	***6.91E+00***	***6.25E+00***	**6.08E+00**	***3.35E+00***	***2.99E+00***	***2.71E+00***	**2.64E+00**
THALLIUM	7.40E-03	7.40E-02	***1.06E+00***	5.91E-01	2.16E-01	1.22E-01	*1.06E-01*	5.91E-02	*2.16E-02*	1.22E-02
PCBS										
TOTAL PCBS (ND = 0)	9.00E-03	8.90E-02	***3.71E+01***	***3.47E+01***	***3.28E+01***	**3.23E+01**	***3.75E+00***	***3.51E+00***	***3.31E+00***	**3.27E+00**
TOTAL PCBS (ND = DL)	9.00E-03	8.90E-02	***3.85E+01***	***3.61E+01***	***3.42E+01***	**3.37E+01**	***3.89E+00***	***3.65E+00***	***3.46E+00***	**3.41E+00**

Italics = Dose from Coke Point greater than dose from background.
Bold = HQ greater than one.
Bold and italics = Dose from Coke Point greater than dose from background and HQ greater than one.

TABLE 5.1
ARSENIC SPECIATION IN AQUATIC ORGANISMS

MATRIX	Average of Total Arsenic (mg/kg)	Average of Inorganic Arsenic (mg/kg)	Inorganic Arsenic Qualifier	Number of Samples	Minimum Percent Inorganic Arsenic	Maximum Percent Inorganic Arsenic	Average of Percent Inorganic Arsenic
Coke Point Offshore Area							
Crab Meat	0.1765	0.02		2	11.2	11.5	11.3
Crab Mustard	0.8175	0.0625		2	6.9	8.5	7.7
Fish Whole Body	0.1615	0.0645		2	34.8	41.9	38.4
Patapsco River Background							
Crab Meat	0.261	0.022		2	8.0	8.7	8.4
Crab Mustard	0.66	0.0475		2	6.2	8.5	7.4
Fish Filet	0.021	0.004	J	1	19.0	19.0	19.0
Fish Filet	0.023	0.003	U	1	13.0	13.0	13.0

Average Percent Inorganic Arsenic in Coke Point Offshore Area Tissue = 10.4
Average Percent Inorganic Arsenic in Patapsco River Background Area Tissue = 12.0

TABLE 5.2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for(5) Contaminant Deletion or Selection
BUTYLTINS															
688-73-3	TRIBUTYLTIN	1.90E-02	J	1.90E-02	J	mg/kg	S-B1	1/13	2.50E-03 - 8.90E-03	1.90E-02	NA	1.18E+02	N	No	BSL
DIOXINS															
WHOTEQNDDL	WHO TEQ (ND=DL)	3.70E-06		7.77E-05		mg/kg	BH-SED-10-00_10	27/27	1.60E-05 - 1.60E-05	7.77E-05	NA	5.03E-04		No	BSL
METALS															
7429-90-5	ALUMINUM	8.92E+03	J	2.51E+04		mg/kg	BH-SED-03F-00_10	19/19	2.80E+00 - 3.21E+01	2.51E+04	NA	NA		No	NSL
7440-36-0	ANTIMONY	2.80E-01	L	3.30E+00	J	mg/kg	BH-SED-03F-00_10	37/37	1.90E-01 - 2.80E+00	3.30E+00	NA	2.35E+02	N	No	BSL
7440-38-2	**ARSENIC**	**4.50E+00**		**7.20E+01**		**mg/kg**	**SP09-02**	**37/37**	**9.50E-02 - 1.60E+00**	**7.20E+01**	**NA**	**4.36E+01**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	5.00E-01		2.20E+00		mg/kg	SP09-02 / BH-SED-21-00_10 / BH-SED-20-00_10 / BH-SED-19-00_10	37/37	9.50E-02 - 8.00E-01	2.20E+00	NA	5.49E+01	N	No	BSL
7440-43-9	CADMIUM	3.60E-01		7.70E+00		mg/kg	SP09-02	37/37	9.50E-02 - 1.40E+00	7.70E+00	NA	9.80E+02	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	4.20E+01	K	5.04E+02		mg/kg	BH-SED-03F-00_10	37/37	1.90E-01 - 1.40E+00	5.04E+02	NA	7.64E+04	N	No	BSL
7440-48-4	COBALT	1.35E+01		5.30E+01		mg/kg	SP09-03	19/19	4.70E-02 - 8.00E+00	5.30E+01	NA	1.18E+03	N	No	BSL
7440-50-8	COPPER	2.74E+01		5.95E+02	L	mg/kg	BH-SED-03C-00_09	37/37	1.90E-01 - 4.00E+00	5.95E+02	NA	1.57E+05	N	No	BSL
57-12-5	CYANIDE	2.60E-01	B	8.40E+01		mg/kg	S-B1	16/19	9.40E-01 - 6.90E+00	8.40E+01	NA	7.84E+04	N	No	BSL
7439-89-6	IRON	2.87E+04		1.20E+05		mg/kg	SP09-03	19/19	4.70E+00 - 7.52E+01	1.20E+05	NA	NA		No	NSL
7439-92-1	LEAD	4.30E+01		1.28E+03		mg/kg	SP09-02	37/37	9.50E-02 - 8.30E-01	1.28E+03	NA	NA		No	NSL
7439-96-5	MANGANESE	6.75E+02		1.59E+03		mg/kg	BH-SED-19-00_10 / S-B1	19/19	4.70E-02 - 2.40E+00	1.59E+03	NA	8.06E+03	N	No	BSL
7439-97-6	MERCURY	1.30E-01		1.70E+00		mg/kg	BH-SED-10-00_09	37/37	3.10E-02 - 9.00E-02	1.70E+00	NA	8.23E+01	N	No	BSL
7440-02-0	NICKEL	1.77E+01		5.64E+01		mg/kg	BH-SED-10-00_09	37/37	9.50E-02 - 6.40E+00	5.64E+01	NA	6.72E+03	N	No	BSL
7782-49-2	SELENIUM	3.20E-01	J	1.23E+01	L	mg/kg	SP09-02	37/37	4.70E-01 - 1.40E+00	1.23E+01	NA	4.20E+04	N	No	BSL
7440-22-4	SILVER	1.20E-01		2.80E+00		mg/kg	BH-SED-03C-00_09 / SP09-02	37/37	9.50E-02 - 8.00E-01	2.80E+00	NA	1.68E+03	N	No	BSL
7440-28-0	THALLIUM	2.20E-01		9.80E-01		mg/kg	SP09-02	33/37	9.50E-02 - 1.60E+00	9.80E-01	NA	NA		No	NSL
7440-31-5	TIN	2.60E+00		2.00E+02		mg/kg	BH-SED-03F-00_10	19/19	4.70E-01 - 1.61E+01	2.00E+02	NA	NA		No	NSL
7440-62-2	VANADIUM	6.35E+01		1.70E+02		mg/kg	BH-SED-03F-00_10	9/9	1.30E-01 - 2.40E-01	1.70E+02	NA	4.20E+04	N	No	BSL
7440-66-6	ZINC	9.95E+01		2.73E+03		mg/kg	BH-SED-10-00_09	37/37	4.70E-01 - 6.70E+00	2.73E+03	NA	NA		No	NSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	1.50E-02	J	3.30E+00		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	3.30E+00	NA	5.20E+02	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	2.70E-02	J	6.50E+00		mg/kg	BH-SED-03B-00_09	37/37	3.20E-02 - 2.20E+00	6.50E+00	NA	1.21E+03	N	No	BSL
83-32-9	ACENAPHTHENE	4.20E-02	J	5.90E+00		mg/kg	BH-SED-03B-00_09	37/37	3.20E-02 - 2.20E+00	5.90E+00	NA	1.81E+04	N	No	BSL
208-96-8	ACENAPHTHYLENE	5.70E-02	J	4.10E+01		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	4.10E+01	NA	1.81E+04	C	No	BSL
120-12-7	ANTHRACENE	1.40E-01	J	2.10E+01		mg/kg	BH-SED-07-00_09	37/37	6.30E-02 - 1.10E+01	2.10E+01	NA	9.04E+04	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**2.80E-01**		**6.10E+01**		**mg/kg**	**BH-SED-07-00_09**	**37/37**	**3.20E-02 - 2.70E+00**	**6.10E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**3.20E-01**		**5.60E+01**		**mg/kg**	**BH-SED-07-00_09**	**37/37**	**3.20E-02 - 2.70E+00**	**5.60E+01**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**5.80E-01**		**5.30E+01**		**mg/kg**	**BH-SED-05-00_09**	**37/37**	**3.20E-02 - 2.20E+00**	**5.30E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	2.20E-01	J /	2.00E+01		mg/kg	BH-SED-06-00_09	37/37	3.20E-02 - 2.20E+00	2.00E+01	NA	9.04E+03	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	1.90E-01	J	1.80E+01		mg/kg	BH-SED-07-00_09	19/37	3.20E-02 - 2.20E+00	1.80E+01	NA	9.61E+01	C	No	BSL
218-01-9	CHRYSENE	2.80E-01		6.30E+01		mg/kg	BH-SED-07-00_09	37/37	3.20E-02 - 2.70E+00	6.30E+01	NA	9.61E+02	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**8.60E-02**	**J**	**6.30E+00**		**mg/kg**	**BH-SED-06-00_09**	**34/37**	**3.20E-02 - 2.20E+00**	**6.30E+00**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	5.30E-01		1.40E+02		mg/kg	BH-SED-07-00_09	37/37	3.20E-02 - 2.70E+00	1.40E+02	NA	1.21E+04	N	No	BSL
86-73-7	FLUORENE	6.30E-02		4.50E+00		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	4.50E+00	NA	1.21E+04	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**1.80E-01**	**J**	**2.50E+01**		**mg/kg**	**BH-SED-05-00_09**	**37/37**	**3.20E-02 - 2.20E+00**	**2.50E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
91-20-3	**NAPHTHALENE**	**4.60E-01**		**7.20E+03**		**mg/kg**	**BH-SED-03B-00_09**	**37/37**	**3.20E-02 - 1.10E+02**	**7.20E+03**	**NA**	**6.03E+03**	**C**	**Yes**	**ASL**
85-01-8	PHENANTHRENE	2.40E-01		2.00E+01		mg/kg	BH-SED-03B-00_09 / SP09-02	37/37	3.20E-02 - 2.20E+00	2.00E+01	NA	9.04E+03	N	No	BSL
129-00-0	PYRENE	3.50E-01		5.90E+01		mg/kg	BH-SED-05-00_09	37/37	3.20E-02 - 2.20E+00	5.90E+01	NA	9.04E+03	N	No	BSL

TABLE 5.2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for(5) Contaminant Deletion or Selection
PCB CONGENERS															
PCBs	**TOTAL PCBs (ND=DL)**	**1.17E-02**		**4.89E-01**		**mg/kg**	**S-B1**	**26/27**	**2.80E-03 - 2.80E-03**	**4.89E-01**	**NA**	**1.08E-03**		**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS															
71-43-2	BENZENE	4.00E-03	J	7.90E-02		mg/kg	BH-SED-13A-00_09	3/33	6.60E-03 - 2.90E-02	7.90E-02	NA	7.13E+04	C	No	BSL
100-41-4	ETHYLBENZENE	4.90E-03	J	4.90E-03	J	mg/kg	BH-SED-13A-00_09	1/33	6.60E-03 - 2.90E-02	4.90E-03	NA	5.94E+03	C	No	BSL
75-09-2	METHYLENE CHLORIDE	3.60E-03	J	3.60E-03	J	mg/kg	SP09-06	1/33	6.60E-03 - 2.90E-02	3.60E-03	NA	NA		No	NSL
108-88-3	TOLUENE	2.40E-03	J	5.70E-02		mg/kg	BH-SED-13A-00_09	2/33	6.60E-03 - 2.90E-02	5.70E-02	NA	NA		No	NSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.

TABLE 5.2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for(5) Contaminant Deletion or Selection
METALS															
7429-90-5	ALUMINUM	2.26E+01	J	9.04E+01		µg/L	BH-W-20-D_10	51/51	3.00E+01 - 3.00E+01	9.04E+01	NA	1.24E+06	N	No	BSL
7440-36-0	ANTIMONY	1.30E-01	B	3.20E-01	J / J	µg/L	BH-W-10B-D_10 / BH-W-02-S_10	51/51	2.00E+00 - 2.00E+00	3.20E-01	NA	7.44E+01	N	No	BSL
7440-38-2	ARSENIC	2.60E+00		7.60E+00		µg/L	BH-W-19-D_10	51/51	1.00E+00 - 1.00E+00	7.60E+00	NA	1.93E+01	C	No	BSL
7440-41-7	BERYLLIUM	4.40E-02	J	4.70E-02	J	µg/L	BH-W-11-D_10	2/51	1.00E+00 - 1.00E+00	4.70E-02	NA	1.74E+01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	2.10E+00		4.90E+00		µg/L	BH-W-09B-M_10	51/51	2.00E+00 - 2.00E+00	4.90E+00	NA	2.42E+04	C	No	BSL
7440-48-4	COBALT	2.80E-01	J	5.20E-01		µg/L	BH-W-20-D_10	51/51	5.00E-01 - 5.00E-01	5.20E-01	NA	9.31E+02	N	No	BSL
7440-50-8	COPPER	1.80E+00	J / J / J	2.90E+00		µg/L	BH-W-03D-D_10 / BH-W-02-S_10	51/51	2.00E+00 - 2.00E+00	2.90E+00	NA	4.96E+04	N	No	BSL
7439-89-6	IRON	5.35E+01		2.12E+02		µg/L	BH-W-20-D_10	51/51	5.00E+01 - 5.00E+01	2.12E+02	NA	8.69E+05	N	No	BSL
7439-92-1	LEAD	2.30E-02	J / J	5.60E-01	J	µg/L	BH-W-11-D_10	51/51	1.00E+00 - 1.00E+00	5.60E-01	NA	1.50E+01		No	BSL
7439-96-5	MANGANESE	2.22E+01		1.98E+02		µg/L	BH-W-20-D_10	51/51	5.00E-01 - 5.00E-01	1.98E+02	NA	1.19E+03	N	No	BSL
7439-97-6	MERCURY	3.90E-02	J / J	6.30E-02	J	µg/L	BH-W-13B-S_10	5/51	2.00E-01 - 2.00E-01	6.30E-02	NA	2.61E+01	N	No	BSL
7440-02-0	NICKEL	4.80E+00		7.90E+00		µg/L	BH-W-03D-D_10	51/51	1.00E+00 - 1.00E+00	7.90E+00	NA	4.96E+03	N	No	BSL
7782-49-2	SELENIUM	6.40E+00		2.45E+01		µg/L	BH-W-19-D_10	51/51	5.00E+00 - 5.00E+00	2.45E+01	NA	6.20E+03	N	No	BSL
7440-28-0	THALLIUM	1.60E-02	B / B / J	1.30E-01	B / B	µg/L	BH-W-02-M_10 / BH-W-10-M_10	37/51	1.00E+00 - 1.00E+00	1.30E-01	NA	NA		No	NSL
7440-31-5	TIN	1.50E+00	J	3.20E+00	J	µg/L	BH-W-10-S_10	11/51	5.00E+00 - 5.00E+00	3.20E+00	NA	7.44E+05	N	No	BSL
7440-62-2	VANADIUM	1.00E-01	B	2.80E+00		µg/L	BH-W-13B-S_10	48/51	1.00E+00 - 1.00E+00	2.80E+00	NA	6.20E+03	N	No	BSL
7440-66-6	ZINC	3.70E+00	J	8.46E+01		µg/L	BH-W-03F-S_10	51/51	5.00E+00 - 5.00E+00	8.46E+01	NA	6.20E+05	N	No	BSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	1.60E-02	J / J	2.00E-01		µg/L	BH-W-13A-S_09	43/96	1.90E-01 - 1.90E-01	2.00E-01	NA	1.07E+01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	1.50E-02	J	3.50E-01		µg/L	BH-W-13A-S_09	63/96	1.90E-01 - 1.90E-01	3.50E-01	NA	5.41E+01	N	No	BSL
83-32-9	ACENAPHTHENE	2.40E-02	J / J	1.00E-01	J	µg/L	BH-W-05-S_09	21/96	1.90E-01 - 1.90E-01	1.00E-01	NA	8.66E+02	N	No	BSL
208-96-8	ACENAPHTHYLENE	1.10E-02	J	2.40E-01		µg/L	BH-W-13A-S_09	22/96	1.90E-01 - 1.90E-01	2.40E-01	NA	8.17E+02	C	No	BSL
120-12-7	ANTHRACENE	8.40E-03	J	1.80E+00		µg/L	BH-W-11-S_09	21/96	1.90E-01 - 1.90E-01	1.80E+00	NA	2.62E+03	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**5.80E-02**	**J**	**8.70E+00**		**µg/L**	**BH-W-03A-S_09**	**20/96**	**1.90E-01 - 1.90E-01**	**8.70E+00**	**NA**	**8.44E-02**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**3.40E-02**	**J**	**6.80E+00**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**6.80E+00**	**NA**	**5.67E-03**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**1.60E-02**	**J**	**8.00E+00**		**µg/L**	**BH-W-03A-S_09 / BH-W-11-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**8.00E+00**	**NA**	**5.67E-02**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	1.70E-02	J	9.60E+00		µg/L	BH-W-11-S_09	22/96	1.90E-01 - 1.90E-01	9.60E+00	NA	3.32E+01	N	No	BSL
207-08-9	**BENZO(K)FLUORANTHENE**	**2.10E-02**	**J**	**9.20E+00**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**9.20E+00**	**NA**	**5.74E-01**	**C**	**Yes**	**ASL**
218-01-9	**CHRYSENE**	**5.70E-02**	**J**	**9.60E+00**		**µg/L**	**BH-W-03A-S_09**	**20/96**	**1.90E-01 - 1.90E-01**	**9.60E+00**	**NA**	**6.65E+00**	**C**	**Yes**	**ASL**
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**5.70E-02**	**J**	**1.10E+01**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**1.10E+01**	**NA**	**2.64E-03**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	1.00E-02	J / J	4.70E+00		µg/L	BH-W-11-S_09	50/96	1.90E-01 - 1.90E-01	4.70E+00	NA	2.26E+02	N	No	BSL
86-73-7	FLUORENE	1.90E-02	J	1.50E-01	J	µg/L	BH-W-11-S_09	40/96	1.90E-01 - 1.90E-01	1.50E-01	NA	4.51E+02	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**1.90E-02**	**J**	**9.90E+00**		**µg/L**	**BH-W-03A-S_09**	**23/96**	**1.90E-01 - 1.90E-01**	**9.90E+00**	**NA**	**3.97E-02**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	3.80E-02	J	6.70E+00		µg/L	BH-W-13A-S_09	92/96	1.90E-01 - 1.90E-01	6.70E+00	NA	5.28E+02	C	No	BSL
85-01-8	PHENANTHRENE	4.20E-02	J	1.20E+00		µg/L	BH-W-11-S_09	84/96	1.90E-01 - 1.90E-01	1.20E+00	NA	2.66E+02	N	No	BSL
129-00-0	PYRENE	1.10E-02	J	4.70E+00		µg/L	BH-W-11-S_09	29/96	1.90E-01 - 1.90E-01	4.70E+00	NA	1.85E+02	N	No	BSL
VOLATILE ORGANIC COMPOUNDS															
95-50-1	1,2-DICHLOROBENZENE	2.90E+00	J	2.90E+00	J	µg/L	BH-W-05-D_09	1/96	5.00E+00 - 5.00E+00	2.90E+00	NA	2.72E+03	N	No	BSL
71-43-2	**BENZENE**	**1.00E+00**	**J / J / J / J**	**7.20E+01**	**L**	**µg/L**	**BH-W-05-S_09**	**50/96**	**5.00E+00 - 5.00E+00**	**7.20E+01**	**NA**	**3.51E+01**	**C**	**Yes**	**ASL**
67-66-3	CHLOROFORM	1.00E+00	J	1.00E+00	J	µg/L	BH-W-02-S_09	1/96	5.00E+00 - 5.00E+00	1.00E+00	NA	1.37E+02	C	No	BSL
100-41-4	ETHYLBENZENE	7.40E-01	J	4.00E+01		µg/L	BH-W-09-D_09	9/96	5.00E+00 - 5.00E+00	4.00E+01	NA	5.37E+01	C	No	BSL
108-88-3	TOLUENE	8.50E-01	J	1.50E+01		µg/L	BH-W-05-D_09	59/84	5.00E+00 - 5.00E+00	1.50E+01	NA	3.20E+04	N	No	BSL
1330-20-7	XYLENES (TOTAL)	2.80E+00	J	6.50E+00	J	µg/L	BH-W-03B-S_10	14/42	1.50E+01 - 1.50E+01	6.50E+00	NA	4.68E+03	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
µg/L = micrograms per liter

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
L = Reported value may be biased low.

TABLE 5.2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
BUTYLTINS									
688-73-3	TRIBUTYLTIN	mg/kg	1.90E-02	1.21E+00	2.30E-02	4.06E-02	N	No	BSL
DIOXINS									
WHOTEQNDDL	**WHO TEQ (ND=DL)**	**mg/kg**	**2.59E-05**	**2.35E-01**	**6.09E-06**	**2.43E-08**	**C**	**Yes**	**ASL**
METALS									
7429-90-5	ALUMINUM	mg/kg	NA	NA	6.46E+00	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	mg/kg	NA	NA	3.39E-02	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**mg/kg**	**NA**	**NA**	**1.22E+00**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-43-9	**CADMIUM**	**mg/kg**	**NA**	**NA**	**1.51E-01**	**1.35E-01**	**N**	**Yes**	**ASL**
16065-83-1	CHROMIUM, TRIVALENT	mg/kg	NA	NA	1.96E-01	2.03E+02	N	No	BSL
7440-48-4	**COBALT**	**mg/kg**	**NA**	**NA**	**1.26E-01**	**4.06E-02**	**N**	**Yes**	**ASL**
7440-50-8	**COPPER**	**mg/kg**	**NA**	**NA**	**1.07E+01**	**5.41E+00**	**N**	**Yes**	**ASL**
7439-89-6	IRON	mg/kg	NA	NA	4.47E+01	9.46E+01	N	No	BSL
7439-92-1	LEAD	mg/kg	NA	NA	1.51E-01	NA		No	NSL
7439-96-5	MANGANESE	mg/kg	NA	NA	8.76E+00	1.89E+01	N	No	BSL
7439-97-6	MERCURY	mg/kg	NA	NA	1.91E-02	2.16E-02	N	No	BSL
7440-02-0	NICKEL	mg/kg	NA	NA	1.88E-01	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	**mg/kg**	**NA**	**NA**	**1.00E+00**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-22-4	SILVER	mg/kg	NA	NA	3.27E-01	6.76E-01	N	No	BSL
7440-28-0	THALLIUM	mg/kg	NA	NA	1.29E-03	NA		No	NSL
7440-31-5	TIN	mg/kg	NA	NA	4.67E-02	8.11E+01	N	No	BSL
7440-66-6	**ZINC**	**mg/kg**	**NA**	**NA**	**4.59E+01**	**4.06E+01**	**N**	**Yes**	**ASL**

TABLE 5.2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
PAHS									
91-57-6	2-METHYLNAPHTHALENE	mg/kg	NA	NA	2.80E-03	5.41E-01	N	No	BSL
83-32-9	ACENAPHTHENE	mg/kg	NA	NA	1.19E-02	8.11E+00	N	No	BSL
208-96-8	ACENAPHTHYLENE	mg/kg	NA	NA	6.69E-03	2.70E+00	N	No	BSL
120-12-7	ANTHRACENE	mg/kg	NA	NA	1.01E-02	4.06E+01	N	No	BSL
50-32-8	**BENZO(A)PYRENE**	**mg/kg**	**NA**	**NA**	**4.85E-03**	**4.32E-04**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**mg/kg**	**NA**	**NA**	**2.77E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
207-08-9	BENZO(K)FLUORANTHENE	mg/kg	NA	NA	3.92E-03	4.32E-02	C	No	BSL
218-01-9	CHRYSENE	mg/kg	NA	NA	8.95E-03	4.32E-01	C	No	BSL
206-44-0	FLUORANTHENE	mg/kg	NA	NA	7.79E-02	5.41E+00	N	No	BSL
86-73-7	FLUORENE	mg/kg	NA	NA	1.75E-03	5.41E+00	N	No	BSL
91-20-3	NAPHTHALENE	mg/kg	NA	NA	1.60E-02	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	mg/kg	NA	NA	1.60E-02	4.06E+01	N	No	BSL
129-00-0	PYRENE	mg/kg	NA	NA	4.13E-02	4.06E+00	N	No	BSL
PCB CONGENERS									
PSBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**NA**	**NA**	**1.99E-01**	**2.43E-07**	**C**	**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS									
71-43-2	**BENZENE**	**mg/kg**	**7.90E-02**	**1.00E+00**	**7.90E-02**	**5.74E-02**	**C**	**Yes**	**ASL**
100-41-4	ETHYLBENZENE	mg/kg	4.90E-03	1.00E+00	4.90E-03	2.87E-01	C	No	BSL
75-09-2	METHYLENE CHLORIDE	mg/kg	3.60E-03	1.00E+00	3.60E-03	4.21E-01	C	No	BSL
108-88-3	TOLUENE	mg/kg	5.70E-02	1.00E+00	5.70E-02	1.08E+01	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) For butyltins, dioxins and volatile organic compounds, the concentration used for screening is determined by multiplying the sediment exposure point concentration by the bioaccumulation factors (BAFs). Modeled crab concentrations reflect wet weight concentrations. For all other chemicals, the concentration used for screening represents the 95%UCLM of actual tissue concentrations.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:

BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 5.2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Units	Surface Water EPC Value (µg/L)	BAF	Concentration(1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
METALS									
7429-90-5	ALUMINUM	mg/kg	NA	NA	2.00E+00	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	mg/kg	NA	NA	1.35E-02	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	mg/kg	**NA**	**NA**	**4.43E-01**	**2.10E-03**	**C**	**Yes**	**ASL**
16065-83-1	CHROMIUM, TRIVALENT	mg/kg	NA	NA	7.20E-02	2.03E+02	N	No	BSL
7440-48-4	COBALT	mg/kg	NA	NA	3.10E-02	4.06E-02	N	No	BSL
7440-50-8	COPPER	mg/kg	NA	NA	3.37E+00	5.41E+00	N	No	BSL
7439-89-6	IRON	mg/kg	NA	NA	7.02E+00	9.46E+01	N	No	BSL
7439-92-1	LEAD	mg/kg	NA	NA	2.49E-01	NA		No	NSL
7439-96-5	MANGANESE	mg/kg	NA	NA	3.52E+00	1.89E+01	N	No	BSL
7439-97-6	**MERCURY**	mg/kg	**NA**	**NA**	**5.55E-02**	**2.16E-02**	**N**	**Yes**	**ASL**
7440-02-0	NICKEL	mg/kg	NA	NA	6.02E-02	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	mg/kg	**NA**	**NA**	**9.25E-01**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-22-4	SILVER	mg/kg	NA	NA	4.20E-02	6.76E-01	N	No	BSL
7440-31-5	TIN	mg/kg	NA	NA	1.40E-01	8.11E+01	N	No	BSL
7440-66-6	ZINC	mg/kg	NA	NA	1.28E+01	4.06E+01	N	No	BSL
PAHS									
83-32-9	ACENAPHTHENE	mg/kg	NA	NA	3.60E-03	8.11E+00	N	No	BSL
206-44-0	FLUORANTHENE	mg/kg	NA	NA	1.35E-02	5.41E+00	N	No	BSL
91-20-3	NAPHTHALENE	mg/kg	NA	NA	1.30E-02	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	mg/kg	NA	NA	5.80E-03	4.06E+01	N	No	BSL
PCB CONGENERS									
PSBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**NA**	**NA**	**2.00E-01**	**2.43E-07**	**C**	**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS									
95-50-1	1,2-DICHLOROBENZENE	µg/L	2.90E+00	8.51E+01	2.47E-01	1.22E+01	N	No	BSL
71-43-2	**BENZENE**	**µg/L**	**1.25E+01**	**1.18E+01**	**1.47E-01**	**5.74E-02**	**C**	**Yes**	**ASL**
67-66-3	CHLOROFORM	µg/L	1.00E+00	9.26E+00	9.26E-03	1.02E-01	C	No	BSL
100-41-4	ETHYLBENZENE	µg/L	2.59E+00	5.56E+01	1.44E-01	2.87E-01	C	No	BSL
108-88-3	TOLUENE	µg/L	2.79E+00	2.94E+01	8.20E-02	1.08E+01	N	No	BSL
1330-20-7	XYLENES (TOTAL)	µg/L	4.44E+00	5.32E+01	2.36E-01	2.70E+01	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) For volatile organic compounds, the concentration used for screening is determined by multiplying the surface water exposure point concentration by the bioaccumulation factors (BAFs) and a conversion factor 1E-03 mg/µg. For all other chemicals, the concentration used for screening represents the 95%UCL of actual tissue concentrations.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl

TABLE 5.2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for (5) Contaminant Deletion or Selection
DIOXINS															
WHOTEQNDD	WHO TEQ (ND=DL)	7.84E-07		1.15E-05		mg/kg	BKGD-SED-01-00_10	6/6	0.00E+00 - 0.00E+00	1.15E-05	NA	5.03E-04		No	BSL
METALS															
7429-90-5	ALUMINUM	4.39E+03		2.04E+04		mg/kg	BKGD-SED-01-00_10	3/3	2.00E+00 - 4.90E+00	2.04E+04	NA	NA		No	NSL
7440-36-0	ANTIMONY	2.10E-01	L	1.70E+00	L	mg/kg	BKGD-SED-01-00_10	3/3	1.30E-01 - 3.30E-01	1.70E+00	NA	2.35E+02	N	No	BSL
7440-38-2	ARSENIC	2.20E+00		1.62E+01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 1.00E+00	1.62E+01	NA	4.36E+01	C	No	BSL
7440-39-3	BARIUM	5.10E+00	J	1.32E+01	J	mg/kg	EH-4	3/3	1.90E+01 - 2.01E+01	1.32E+01	NA	5.49E+04	N	No	BSL
7440-41-7	BERYLLIUM	4.60E-01		1.70E+00		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	1.70E+00	NA	5.49E+01	N	No	BSL
7440-43-9	CADMIUM	8.30E-02	J	1.60E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 5.00E-01	1.60E+00	NA	9.80E+02	N	No	BSL
7440-47-3	CHROMIUM	2.28E+01		2.25E+02		mg/kg	BKGD-SED-01-00_10	6/6	1.30E-01 - 5.00E-01	2.25E+02	NA	7.64E+04	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	4.60E-01	B	8.00E-01		mg/kg	EH-4	3/3	5.00E-01 - 5.10E-01	8.00E-01	NA	7.64E+04	N	No	BSL
7440-48-4	COBALT	7.80E+00		1.98E+01		mg/kg	BKGD-SED-01-00_10	3/3	3.30E-02 - 8.20E-02	1.98E+01	NA	1.18E+03	N	No	BSL
7440-50-8	COPPER	4.60E+00		1.05E+02		mg/kg	BKGD-SED-01-00_10	6/6	1.30E-01 - 2.50E+00	1.05E+02	NA	1.57E+05	N	No	BSL
57-12-5	CYANIDE	3.90E-01	B J	4.10E-01	BJ	mg/kg	EH-2 / EH-4	3/6	6.30E-01 - 1.60E+00	4.10E-01	NA	1.68E+05	N	No	BSL
7439-89-6	IRON	3.30E+03		4.38E+04		mg/kg	BKGD-SED-01-00_10	6/6	3.30E+00 - 1.00E+01	4.38E+04	NA	NA		No	NSL
7439-92-1	LEAD	6.80E+00		1.21E+02		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 6.00E-01	1.21E+02	NA	NA		No	NSL
7439-96-5	MANGANESE	4.51E+02		1.26E+03		mg/kg	BKGD-SED-03-00_10	3/3	3.30E-02 - 8.20E-02	1.26E+03	NA	3.76E+03	N	No	BSL
7439-97-6	MERCURY	1.40E-02	J	3.90E-01		mg/kg	BKGD-SED-01-00_10	5/6	2.20E-02 - 5.40E-02	3.90E-01	NA	8.23E+01	N	No	BSL
7440-02-0	NICKEL	2.50E+00	J	3.74E+01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 4.00E+00	3.74E+01	NA	3.13E+03	N	No	BSL
7782-49-2	SELENIUM	5.00E-01		2.40E+00		mg/kg	BKGD-SED-01-00_10	3/6	3.30E-01 - 1.00E+00	2.40E+00	NA	1.96E+04	N	No	BSL
7440-22-4	SILVER	3.80E-02	J	9.40E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 5.00E-01	9.40E-01	NA	7.84E+02	N	No	BSL
7440-28-0	THALLIUM	6.20E-02	J	2.80E-01		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	2.80E-01	NA	NA		No	NSL
7440-31-5	TIN	2.80E+00		3.85E+01		mg/kg	BKGD-SED-01-00_10	3/3	3.30E-01 - 8.20E-01	3.85E+01	NA	NA		No	NSL
7440-62-2	VANADIUM	2.14E+01		9.44E+01		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	9.44E+01	NA	1.96E+04	N	No	BSL
7440-66-6	ZINC	3.01E+01		4.29E+02		mg/kg	BKGD-SED-01-00_10	6/6	3.30E-01 - 2.00E+00	4.29E+02	NA	NA		No	NSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	2.10E-03	J	3.30E-01		mg/kg	BKGD-SED-01-00_10	3/6	6.30E-03 - 1.10E-01	3.30E-01	NA	5.20E+02	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	2.40E-03	J	6.30E-01		mg/kg	BKGD-SED-01-00_10	5/6	6.30E-03 - 1.10E-01	6.30E-01	NA	1.21E+03	N	No	BSL
83-32-9	ACENAPHTHENE	1.60E-02	J	4.40E-01		mg/kg	BKGD-SED-01-00_10	2/6	6.30E-03 - 1.10E-01	4.40E-01	NA	1.81E+04	N	No	BSL
208-96-8	ACENAPHTHYLENE	1.10E-02	J	3.80E-01		mg/kg	BKGD-SED-01-00_10	3/6	6.30E-03 - 1.10E-01	3.80E-01	NA	1.81E+04	C	No	BSL
120-12-7	ANTHRACENE	1.80E-03	J	6.50E-01		mg/kg	BKGD-SED-01-00_10	5/6	6.30E-03 - 5.30E-01	6.50E-01	NA	9.04E+04	N	No	BSL
56-55-3	BENZO(A)ANTHRACENE	3.70E-03	J	1.20E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.20E+00	NA	9.61E+00	C	No	BSL
50-32-8	**BENZO(A)PYRENE**	**3.70E-03**	**J**	**1.10E+00**		**mg/kg**	**BKGD-SED-01-00_10**	**6/6**	**6.30E-03 - 1.10E-01**	**1.10E+00**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
205-99-2	BENZO(B)FLUORANTHENE	5.60E-03	J	1.90E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.90E+00	NA	9.61E+00	C	No	BSL
191-24-2	BENZO(GHI)PERYLENE	4.70E-03	J / J	8.30E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.30E-01	NA	9.04E+03	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	6.50E-03		2.70E-02	J	mg/kg	BKGD-SED-03-00_10	3/6	6.30E-03 - 1.10E-01	2.70E-02	NA	9.61E+01	C	No	BSL
218-01-9	CHRYSENE	3.80E-03	J	1.00E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.00E+00	NA	9.61E+02	C	No	BSL
53-70-3	DIBENZO(A,H)ANTHRACENE	2.60E-03	J	2.60E-01		mg/kg	BKGD-SED-01-00_10	4/6	6.30E-03 - 1.10E-01	2.60E-01	NA	9.61E-01	C	No	BSL
206-44-0	FLUORANTHENE	3.90E-03	J	2.20E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	2.20E+00	NA	1.21E+04	N	No	BSL
86-73-7	FLUORENE	2.10E-03	J	6.30E-01		mg/kg	BKGD-SED-01-00_10	4/6	6.30E-03 - 1.10E-01	6.30E-01	NA	1.21E+04	N	No	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	3.70E-03	J	8.70E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.70E-01	NA	9.61E+00	C	No	BSL
91-20-3	NAPHTHALENE	4.90E-03	J	8.30E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.30E+00	NA	6.03E+03	C	No	BSL
85-01-8	PHENANTHRENE	3.40E-03	J	2.00E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	2.00E+00	NA	9.04E+03	N	No	BSL
129-00-0	PYRENE	5.10E-03	J	1.40E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.40E+00	NA	9.04E+03	N	No	BSL

TABLE 5.2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
PCB CONGENERS														
PCBs	**TOTAL PCBs (ND=DL)**	**6.96E-03**		**5.83E-02**		**mg/kg**	**BKGD-SED-01-00_10**	**6/6**	**2.60E-04 - 2.60E-04**	**5.83E-02**	**NA**	**1.08E-03**	**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS														
75-09-2	METHYLENE CHLORIDE	3.40E-03	J	3.40E-03	J	mg/kg	EH-4	1/6	6.30E-03 - 1.60E-02	3.40E-03	NA	NA	No	NSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
L = Reported value may be biased low.

TABLE 5.2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for (5) Contaminant Deletion or Selection
METALS															
7429-90-5	ALUMINUM	2.59E+01	J	1.06E+02		µg/L	BKGD-W-01-D_10	9/9	2.60E+00 - 2.60E+00	1.06E+02	NA	1.24E+06	N	No	BSL
7440-36-0	ANTIMONY	1.20E-01	J	3.00E-01	J	µg/L	BKGD-W-01-D_10	9/9	1.90E-02 - 1.90E-02	3.00E-01	NA	7.44E+01	N	No	BSL
7440-38-2	ARSENIC	2.60E+00		6.40E+00		µg/L	BKGD-W-01-D_10	9/9	2.90E-01 - 2.90E-01	6.40E+00	NA	1.93E+01	C	No	BSL
7440-41-7	BERYLLIUM	3.80E-02	J	3.80E-02	J	µg/L	BKGD-W-01-D_10	1/9	3.70E-02 - 3.70E-02	3.80E-02	NA	1.74E+01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	3.40E+00		1.42E+01		µg/L	BKGD-W-01-D_10	9/9	5.40E-01 - 5.40E-01	1.42E+01	NA	2.42E+04	N	No	BSL
7440-48-4	COBALT	2.60E-01	J	6.80E-01		µg/L	BKGD-W-01-D_10	9/9	2.60E-02 - 2.60E-02	6.80E-01	NA	9.31E+02	N	No	BSL
7440-50-8	COPPER	1.90E+00	J	2.60E+00		µg/L	BKGD-W-01-D_10	9/9	2.40E-01 - 2.40E-01	2.60E+00	NA	4.96E+04	N	No	BSL
7439-89-6	IRON	7.02E+01	B	2.46E+02		µg/L	BKGD-W-01-D_10	9/9	6.10E+00 - 6.10E+00	2.46E+02	NA	8.69E+05	N	No	BSL
7439-92-1	LEAD	2.10E-02	J	4.60E-01	J	µg/L	BKGD-W-01-D_10	8/9	1.90E-02 - 1.90E-02	4.60E-01	NA	1.50E+01		No	BSL
7439-96-5	MANGANESE	2.09E+01		8.54E+01		µg/L	BKGD-W-01-D_10	9/9	3.90E-02 - 3.90E-02	8.54E+01	NA	1.19E+03	N	No	BSL
7439-97-6	MERCURY	3.90E-02	B	3.90E-02	B	µg/L	BKGD-W-01-S_10 / BKGD-W-03-S_10 / BKGD-W-02-D_10	3/9	3.80E-02 - 3.80E-02	3.90E-02	NA	2.61E+01	N	No	BSL
7440-02-0	NICKEL	4.30E+00		6.60E+00		µg/L	BKGD-W-02-D_10	9/9	1.70E-01 - 1.70E-01	6.60E+00	NA	4.96E+03	N	No	BSL
7782-49-2	SELENIUM	6.60E+00		1.71E+01		µg/L	BKGD-W-02-D_10	9/9	4.20E-01 - 4.20E-01	1.71E+01	NA	6.20E+03	N	No	BSL
7440-28-0	THALLIUM	2.20E-02	J	1.00E-01	J	µg/L	BKGD-W-01-M_10	4/9	1.50E-02 - 1.50E-02	1.00E-01	NA	NA		No	NSL
7440-31-5	TIN	2.90E+00	J	3.70E+00	J	µg/L	BKGD-W-01-M_10	3/9	1.50E+00 - 1.50E+00	3.70E+00	NA	7.44E+05	N	No	BSL
7440-62-2	VANADIUM	5.30E-01	B	2.10E+00		µg/L	BKGD-W-02-M_10	8/9	8.20E-02 - 8.20E-02	2.10E+00	NA	6.20E+03	N	No	BSL
7440-66-6	ZINC	3.60E+00	J	9.00E+00		µg/L	BKGD-W-01-D_10	9/9	9.60E-01 - 9.60E-01	9.00E+00	NA	6.20E+05	N	No	BSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	3.80E-02	J	6.70E-02	J	µg/L	BKGD-W-03-S_10	2/9	1.60E-02 - 1.70E-02	6.70E-02	NA	1.07E+01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	1.60E-02	J	1.50E-01	J	µg/L	BKGD-W-03-S_10	4/9	1.50E-02 - 1.60E-02	1.50E-01	NA	5.41E+01	N	No	BSL
83-32-9	ACENAPHTHENE	1.70E-02	J	1.70E-02	J	µg/L	BKGD-W-01-D_10	1/9	1.40E-02 - 1.40E-02	1.70E-02	NA	8.66E+02	N	No	BSL
120-12-7	ANTHRACENE	2.40E-02	J	2.40E-02	J	µg/L	BKGD-W-01-D_10	1/9	8.10E-03 - 8.60E-03	2.40E-02	NA	2.62E+03	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**3.50E-02**	**J**	**1.40E-01**	**J**	**µg/L**	**BKGD-W-01-D_10**	**2/9**	**1.70E-02 - 1.80E-02**	**1.40E-01**	**NA**	**8.44E-02**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**4.50E-02**	**J**	**5.10E-02**	**J**	**µg/L**	**BKGD-W-01-D_10**	**2/9**	**1.10E-02 - 1.20E-02**	**5.10E-02**	**NA**	**5.67E-03**	**C**	**Yes**	**ASL**
205-99-2	BENZO(B)FLUORANTHENE	4.20E-02	J	4.90E-02	J	µg/L	BKGD-W-01-M_10	2/9	1.50E-02 - 1.60E-02	4.90E-02	NA	5.67E-02	C	No	BSL
191-24-2	BENZO(GHI)PERYLENE	7.40E-02	J	7.40E-02	J	µg/L	BKGD-W-01-M_10	1/9	8.10E-03 - 8.70E-03	7.40E-02	NA	3.32E+01	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	6.50E-02	J	6.90E-02	J	µg/L	BKGD-W-01-M_10	2/9	1.50E-02 - 1.60E-02	6.90E-02	NA	5.74E-01	C	No	BSL
218-01-9	CHRYSENE	3.60E-02	J	1.10E-01	J	µg/L	BKGD-W-01-D_10	2/9	1.00E-02 - 1.10E-02	1.10E-01	NA	6.65E+00	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**7.30E-02**	**J**	**7.30E-02**	**J**	**µg/L**	**BKGD-W-01-M_10**	**1/9**	**1.20E-02 - 1.30E-02**	**7.30E-02**	**NA**	**2.64E-03**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	1.30E-02	J	5.60E-01		µg/L	BKGD-W-01-D_10	4/9	9.40E-03 - 1.00E-02	5.60E-01	NA	2.26E+02	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**7.30E-02**	**J**	**7.30E-02**	**J**	**µg/L**	**BKGD-W-01-M_10**	**1/9**	**1.50E-02 - 1.60E-02**	**7.30E-02**	**NA**	**3.97E-02**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	4.20E-02	J	3.60E-01		µg/L	BKGD-W-03-S_10	5/9	2.60E-02 - 2.80E-02	3.60E-01	NA	5.28E+02	C	No	BSL
85-01-8	PHENANTHRENE	5.70E-02	J	1.30E-01	J	µg/L	BKGD-W-03-M_10	5/9	2.70E-02 - 2.80E-02	1.30E-01	NA	2.66E+02	N	No	BSL
129-00-0	PYRENE	1.20E-02	J	3.10E-01		µg/L	BKGD-W-01-D_10	2/9	1.00E-02 - 1.10E-02	3.10E-01	NA	1.85E+02	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level; NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
µg/L = micrograms per liter

Data Qualifiers:
J = Value is estimated.
L = Reported value may be biased low.

TABLE 5.2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crab
Exposure Point: Patapsco River Background

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening	Screening (2) Toxicity Value		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
DIOXINS									
WHOTEQNDDL	**WHO TEQ (ND=DL)**	**mg/kg**	**2.59E-06**	**2.35E-01**	**6.08E-07**	**2.43E-08**	**C**	**Yes**	**ASL**
METALS									
7429-90-5	ALUMINUM	mg/kg	NA	NA	3.85E+00	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	mg/kg	NA	NA	4.01E-02	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**mg/kg**	**NA**	**NA**	**1.26E+00**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-43-9	**CADMIUM**	**mg/kg**	**NA**	**NA**	**1.85E-01**	**1.35E-01**	**N**	**Yes**	**ASL**
16065-83-1	CHROMIUM	mg/kg	NA	NA	1.22E-01	2.03E+02	N	No	BSL
7440-48-4	**COBALT**	**mg/kg**	**NA**	**NA**	**1.23E-01**	**4.06E-02**	**N**	**Yes**	**ASL**
7440-50-8	**COPPER**	**mg/kg**	**NA**	**NA**	**1.44E+01**	**5.41E+00**	**N**	**Yes**	**ASL**
7439-89-6	IRON	mg/kg	NA	NA	2.11E+01	9.46E+01	N	No	BSL
7439-92-1	LEAD	mg/kg	NA	NA	4.30E-02	NA		No	NSL
7439-96-5	MANGANESE	mg/kg	NA	NA	5.38E+00	1.89E+01	N	No	BSL
7439-97-6	**MERCURY**	**mg/kg**	**NA**	**NA**	**2.36E-02**	**2.16E-02**	**N**	**Yes**	**ASL**
7440-02-0	NICKEL	mg/kg	NA	NA	2.12E-01	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	**mg/kg**	**NA**	**NA**	**1.10E+00**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-22-4	SILVER	mg/kg	NA	NA	3.15E-01	6.76E-01	N	No	BSL
7440-28-0	THALLIUM	mg/kg	NA	NA	8.52E-03	NA		No	NSL
7440-31-5	TIN	mg/kg	NA	NA	2.53E-01	8.11E+00	N	No	BSL
7440-66-6	**ZINC**	**mg/kg**	**NA**	**NA**	**4.69E+01**	**4.06E+01**	**N**	**Yes**	**ASL**
PAHS									
90-12-0	1-METHYLNAPHTHALENE	mg/kg	NA	NA	5.23E-04	1.09E-01	C	No	BSL
83-32-9	ACENAPHTHENE	mg/kg	NA	NA	1.46E-03	8.11E+00	N	No	BSL
191-24-2	BENZO(GHI)PERYLENE	mg/kg	NA	NA	4.15E-03	4.06E+00	N	No	BSL
91-20-3	NAPHTHALENE	mg/kg	NA	NA	8.96E-04	2.70E+00	N	No	BSL
91-20-3	PHENANTHRENE	mg/kg	NA	NA	4.55E-03	4.06E+00	N	No	BSL
PCB CONGENERS									
PCBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**NA**	**NA**	**2.72E-01**	**2.43E-07**	**C**	**Yes**	**ASL**

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening for dioxins is determined by multiplying the sediment exposure point concentration by the bioaccumulation factors (BAFs). Modeled crab concentrations reflect wet weight concentrations. For all other chemicals, the concentration used for screening is the 95%UCLM in actual crab meat and mustard, combined.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 5.2.8
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Patapsco River Background

CAS Number	Chemical	Units	Surface Water EPC Value (µg/L)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
METALS									
7429-90-5	ALUMINUM	mg/kg	NA	NA	9.28E-01	1.35E+02	N	No	BSL
7440-36-0	**ANTIMONY**	**mg/kg**	**NA**	**NA**	**6.09E-02**	**5.41E-02**	**N**	**Yes**	**ASL**
7440-38-2	**ARSENIC**	**mg/kg**	**NA**	**NA**	**5.62E-01**	**2.10E-03**	**C**	**Yes**	**ASL**
16065-83-1	CHROMIUM	mg/kg	NA	NA	4.60E-02	2.03E+02	N	No	BSL
7440-48-4	COBALT	mg/kg	NA	NA	2.90E-02	4.06E-02	N	No	BSL
7440-50-8	**COPPER**	**mg/kg**	**NA**	**NA**	**9.10E+00**	**5.41E+00**	**N**	**Yes**	**ASL**
7439-89-6	IRON	mg/kg	NA	NA	6.81E+00	9.46E+01	N	No	BSL
7439-92-1	LEAD	mg/kg	NA	NA	5.89E-02	NA		No	NSL
7439-96-5	MANGANESE	mg/kg	NA	NA	2.23E+00	1.89E+01	N	No	BSL
7439-97-6	**MERCURY**	**mg/kg**	**NA**	**NA**	**4.60E-02**	**2.16E-02**	**N**	**Yes**	**ASL**
7440-02-0	NICKEL	mg/kg	NA	NA	4.20E-02	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	**mg/kg**	**NA**	**NA**	**1.00E+00**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-22-4	SILVER	mg/kg	NA	NA	9.17E-02	6.76E-01	N	No	BSL
7440-28-0	THALLIUM	mg/kg	NA	NA	6.30E-03	NA		No	NSL
7440-31-5	TIN	mg/kg	NA	NA	2.43E-01	8.11E+01	N	No	BSL
7440-66-6	ZINC	mg/kg	NA	NA	2.42E+01	4.06E+01	N	No	BSL
PAHS									
91-20-3	NAPHTHALENE	mg/kg	NA	NA	6.60E-03	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	mg/kg	NA	NA	6.30E-03	4.06E+01	N	No	BSL
PCB CONGENERS									
PCBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**NA**	**NA**	**2.90E-01**	**2.43E-07**	**C**	**Yes**	**ASL**

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening is the 95%UCLM of actual fish filet.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram
µg/L = micrograms per liter

TABLE 5.3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DIOXINS									
WHO TEQ (ND=DL)	mg/kg	1.34E-05	2.59E-05	7.77E-05		mg/kg	2.59E-05	95%UCLM-C	CRAB COPC
METALS									
ARSENIC	mg/kg	2.34E+01	2.76E+01	7.20E+01		mg/kg	2.76E+01	95%UCLM-G	SD COPC
CADMIUM	mg/kg	2.37E+00	2.97E+00	7.70E+00		mg/kg	2.97E+00	95%UCLM-L	CRAB COPC
COBALT	mg/kg	2.61E+01	2.94E+01	5.30E+01		mg/kg	2.94E+01	95%UCLM-M	CRAB COPC
COPPER	mg/kg	1.38E+02	1.72E+02	5.95E+02	L	mg/kg	1.72E+02	95%UCLM-L	CRAB COPC
SELENIUM	mg/kg	3.39E+00	4.61E+00	1.23E+01	L	mg/kg	4.61E+00	95%UCLM-L	CRAB COPC
ZINC	mg/kg	7.88E+02	9.99E+02	2.73E+03		mg/kg	9.99E+02	95%UCL-L	CRAB COPC
PAHS									
BENZO(A)ANTHRACENE	mg/kg	9.28E+00	1.37E+01	6.10E+01		mg/kg	1.37E+01	95%UCLM-G	SD COPC
BENZO(A)PYRENE	mg/kg	8.93E+00	1.25E+01	5.60E+01		mg/kg	1.25E+01	95%UCLM-G	SD COPC
BENZO(B)FLUORANTHENE	mg/kg	9.30E+00	1.27E+01	5.30E+01		mg/kg	1.27E+01	95%UCLM-G	SD COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	1.43E+00	2.46E+00	6.30E+00		mg/kg	2.46E+00	95%UCLM-KMC	SD COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	5.01E+00	6.97E+00	2.50E+01		mg/kg	6.97E+00	95%UCLM-G	SD COPC
NAPHTHALENE	mg/kg	2.18E+02	2.15E+03	7.20E+03		mg/kg	2.15E+03	95%UCLM-C	SD COPC
PCB CONGENERS									
TOTAL PCBs (ND=DL)	mg/kg	1.50E-01	2.65E-01	4.89E-01		mg/kg	2.65E-01	95%UCLM-KMC	SD COPC
VOLATILE ORGANIC COMPOUNDS									
BENZENE	mg/kg	3.13E-02	NA	7.90E-02		mg/kg	7.90E-02	LOW %DETECTS	CRAB COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009c).
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
95%UCLM-L indicates that the 95 percent upper confidence limit on the mean is based on the Land (H) statistic for lognormal distributions.
95%UCLM-M indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric modified t-test.
LOW %DETECTS indicates low percentage of detects.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram
Data Qualifiers:
L = Reported value may be biased low.

TABLE 5.3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
METALS									
ARSENIC	µg/L	4.10E+00	4.38E+00	7.60E+00		µg/L	4.38E+00	95%UCLM-N	FISH COPC
MERCURY	µg/L	4.78E-02	5.73E-02	6.30E-02		µg/L	5.73E-02	95%UCLM-BCA	FISH COPC
SELENIUM	µg/L	1.25E+01	1.35E+01	2.45E+01		µg/L	1.35E+01	95%UCLM-N	FISH COPC
PAHS									
BENZO(A)ANTHRACENE	µg/L	1.44E+00	9.80E-01	8.70E+00		µg/L	9.80E-01	95%UCLM-KMC	SW COPC
BENZO(A)PYRENE	µg/L	1.06E+00	7.59E-01	6.80E+00		µg/L	7.59E-01	95%UCLM-KMC	SW COPC
BENZO(B)FLUORANTHENE	µg/L	1.40E+00	9.84E-01	8.00E+00		µg/L	9.84E-01	95%UCLM-KMC	SW COPC
BENZO(K)FLUORANTHENE	µg/L	1.47E+00	1.02E+00	9.20E+00		µg/L	1.02E+00	95%UCLM-KMC	SW COPC
CHRYSENE	µg/L	1.63E+00	1.09E+00	9.60E+00		µg/L	1.09E+00	95%UCLM-KMC	SW COPC
DIBENZO(A,H)ANTHRACENE	µg/L	1.77E+00	1.22E+00	1.10E+01		µg/L	1.22E+00	95%UCLM-KMC	SW COPC
INDENO(1,2,3-CD)PYRENE	µg/L	1.54E+00	1.16E+00	9.90E+00		µg/L	1.16E+00	95%UCLM-KMC	SW COPC
VOLATILE ORGANIC COMPOUNDS									
BENZENE	µg/L	1.11E+01	1.25E+01	7.20E+01	L	µg/L	1.25E+01	95%UCLM-KMC	SW COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009c).
95%UCLM-BCA indicates that the 95 percent upper confidence limit on the mean is based on the Kaplan-Meier (KM) Bias-Corrected Accelerated (BCA) percentile bootstrap test.
95%UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
95%UCLM = 95 percent upper confidence limit on the mean
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detection Limit
µg/L = micrograms per liter
Data Qualifiers:
L = Reported value may be biased low.

TABLE 5.3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
DIOXINS								
WHO TEQ (ND=DL)	mg/kg	NA	NA	NA		mg/kg	6.09E-06	CRAB COPC
METALS								
ARSENIC	mg/kg	1.07E+00	1.22E+00	1.24E+00		mg/kg	1.22E+00	CRAB COPC
CADMIUM	mg/kg	1.18E-01	1.51E-01	1.58E-01		mg/kg	1.51E-01	CRAB COPC
COBALT	mg/kg	1.05E-01	1.26E-01	1.38E-01		mg/kg	1.26E-01	CRAB COPC
COPPER	mg/kg	7.97E+00	1.07E+01	1.25E+01		mg/kg	1.07E+01	CRAB COPC
SELENIUM	mg/kg	9.04E-01	1.00E+00	1.07E+00		mg/kg	1.00E+00	CRAB COPC
ZINC	mg/kg	4.18E+01	4.63E+01	4.59E+01		mg/kg	4.59E+01	CRAB COPC
PAHS								
BENZO(A)PYRENE	mg/kg	1.20E-02	1.55E-02	4.85E-03		mg/kg	4.85E-03	CRAB COPC
BENZO(B)FLUORANTHENE	mg/kg	1.77E-02	2.77E-02	3.15E-02		mg/kg	2.77E-02	CRAB COPC
NAPHTHALENE	mg/kg	1.31E-02	1.60E-02	2.20E-02		mg/kg	1.60E-02	SD COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	1.70E-01	1.99E-01	2.10E-01		mg/kg	1.99E-01	CRAB COPC
VOLATILE ORGANIC COMPOUNDS								
BENZENE	mg/kg	NA	NA	NA	NA	mg/kg	7.90E-02	CRAB COPC

Modeled crab concentrations reflect wet weight concentrations.
Bioaccumulation factors (BAFs) are used to determine the concentrations of Dioxins and VOCs in aquatic organisms exposed to sediment. All other chemicals are actual tissue concentrations.

NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram

TABLE 5.3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
METALS								
ARSENIC	mg/kg	1.49E+00	4.43E-01	2.00E+00		mg/kg	4.43E-01	FISH COPC
MERCURY	mg/kg	4.84E-02	5.55E-02	5.60E-02		mg/kg	5.55E-02	FISH COPC
SELENIUM	mg/kg	8.46E-01	9.25E-01	9.70E-01		mg/kg	9.25E-01	FISH COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	1.67E-01	2.00E-01	2.12E-01		mg/kg	2.00E-01	FISH COPC
VOLATILE ORGANIC COMPOUNDS								
BENZENE	mg/kg	NA	NA	NA		mg/kg	1.47E-01	FISH COPC

Bioaccumulation factors (BAFs) are used to determine the concentrations of Volatile Organic Compounds in aquatic organisms exposed to surface water. All other chemicals are actual tissue concentrations.

NA = Not Applicable

95%UCLM = 95 percent upper confidence limit on the mean

EPC = exposure point concentration

PAHS = Polycyclic Aromatic Hydrocarbons

ND = Not Detected

DL = Detection Limit

mg/kg = milligrams per kilogram

TABLE 5.3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DIOXINS									
WHO TEQ (ND=DL)	mg/kg	4.42E-06	8.17E-06	1.15E-05		mg/kg	8.17E-06	95%UCLM-N	CRAB COPC
METALS									
ARSENIC	mg/kg	6.22E+00	1.07E+01	1.62E+01		mg/kg	1.07E+01	95%UCLM-N	CRAB COPC
CADMIUM	mg/kg	4.17E-01	1.35E+00	1.60E+00		mg/kg	1.35E+00	95%UCLM-G	CRAB COPC
COBALT	mg/kg	1.50E+01	NA	1.98E+01		mg/kg	1.98E+01	Maximum	CRAB COPC
COPPER	mg/kg	2.70E+01	9.16E+01	1.05E+02		mg/kg	9.16E+01	95%UCLM-G	CRAB COPC
MERCURY	mg/kg	1.07E-01	2.27E-01	3.90E-01		mg/kg	2.27E-01	95%UCLM-KMt	CRAB COPC
SELENIUM	mg/kg	1.13E+00	NA	2.40E+00		mg/kg	2.40E+00	Maximum	CRAB COPC
ZINC	mg/kg	1.32E+02	3.76E+02	4.29E+02		mg/kg	3.76E+02	95%UCLM-G	CRAB COPC
PAHS									
BENZO(A)PYRENE	mg/kg	2.03E-01	3.04E+00	1.10E+00		mg/kg	1.10E+00	Maximum	SD COPC
PCB CONGENERS									
TOTAL PCBs (ND=DL)	mg/kg	1.70E-02	5.32E-02	5.83E-02		mg/kg	5.32E-02	95%UCLM-C	SD COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009c).
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
Low %Detects indicates low percentage of detects, so the maximum detected value is used.
N < 5 indicates that the number of samples is less than 5, so the maximum detected value is used.
NA = Not Applicable
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram

TABLE 5.3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
METALS									
ANTIMONY	µg/L	2.12E-01	2.53E-01	3.00E-01	J	µg/L	2.53E-01	95%UCLM-N	FISH COPC
ARSENIC	µg/L	3.96E+00	4.69E+00	6.40E+00		µg/L	4.69E+00	95%UCLM-N	FISH COPC
COPPER	µg/L	2.19E+00	2.35E+00	2.60E+00		µg/L	2.35E+00	95%UCLM-N	FISH COPC
MERCURY	µg/L	3.83E-02	NA	3.90E-02	B	µg/L	3.90E-02	Maximum	FISH COPC
SELENIUM	µg/L	1.03E+01	1.26E+01	1.71E+01		µg/L	1.26E+01	95%UCLM-N	FISH COPC
PAHS									
BENZO(A)ANTHRACENE	µg/L	3.28E-02	NA	1.40E-01	J	µg/L	1.40E-01	Maximum	SW COPC
BENZO(A)PYRENE	µg/L	1.93E-02	NA	5.10E-02	J	µg/L	5.10E-02	Maximum	SW COPC
DIBENZO(A,H)ANTHRACENE	µg/L	1.89E-02	NA	7.30E-02	J	µg/L	7.30E-02	Maximum	SW COPC
INDENO(1,2,3-CD)PYRENE	µg/L	2.17E-02	NA	7.30E-02	J	µg/L	7.30E-02	Maximum	SW COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009c).
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
µg/L = micrograms per liter
Data Qualifiers:
B = Value is estimated.
J = Value is estimated.

TABLE 5.3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
DIOXINS								
WHO TEQ (ND=DL)	mg/kg	NA	NA	NA		mg/kg	6.08E-07	CRAB COPC
METALS								
ARSENIC	mg/kg	1.16E+00	1.26E+00	1.26E+00		mg/kg	1.26E+00	CRAB COPC
CADMIUM	mg/kg	1.15E-01	1.85E-01	2.21E-01		mg/kg	1.85E-01	CRAB COPC
COBALT	mg/kg	8.96E-02	1.23E-01	1.41E-01		mg/kg	1.23E-01	CRAB COPC
COPPER	mg/kg	1.20E+01	1.44E+01	1.62E+01		mg/kg	1.44E+01	CRAB COPC
MERCURY	mg/kg	1.85E-02	2.36E-02	2.66E-02		mg/kg	2.36E-02	CRAB COPC
SELENIUM	mg/kg	9.96E-01	1.10E+00	1.13E+00		mg/kg	1.10E+00	CRAB COPC
ZINC	mg/kg	4.09E+01	4.69E+01	4.76E+01		mg/kg	4.69E+01	CRAB COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	2.27E-01	2.72E-01	2.84E-01		mg/kg	2.72E-01	CRAB COPC

Modeled crab concentrations reflect dry weight concentrations.

Bioaccumulation factors (BAFs) are used to determine the concentrations of Dioxins in aquatic organisms exposed to sediment. All other chemicals are actual tissue concentrations.

NA = Not Applicable

95%UCLM = 95 percent upper confidence limit on the mean

EPC = exposure point concentration

PAHS = Polycyclic Aromatic Hydrocarbons

PCB = Polychlorinated Bipheyl

ND = Not Detected

DL = Detection Limit

mg/kg = milligrams per kilogram

TABLE 5.3.8
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
METALS								
ANTIMONY	mg/kg	3.18E-02	6.09E-02	8.60E-02		mg/kg	6.09E-02	FISH COPC
ARSENIC	mg/kg	4.84E-01	5.62E-01	5.70E-01		mg/kg	5.62E-01	FISH COPC
COPPER	mg/kg	3.39E+00	9.10E+00	1.41E+01		mg/kg	9.10E+00	FISH COPC
MERCURY	mg/kg	4.28E-02	4.61E-02	4.60E-02		mg/kg	4.60E-02	FISH COPC
SELENIUM	mg/kg	9.70E-01	1.00E+00	1.00E+00		mg/kg	1.00E+00	FISH COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	3.60E-01	2.90E-01	3.60E-01		mg/kg	2.90E-01	FISH COPC

Chemcial concentrations are based on actual tissue data.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram

TABLE 5.4.1
VALUES USED FOR ADULT RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	0.02	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	4	BPJ (2)	
	ED	Exposure Duration	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time-Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	18,000	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (1)	For organic compounds
	EF	Exposure Frequency	day/yr	4	BPJ (2)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	30	U.S. EPA 1989	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DA_{event} = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) Swimming is estimated to occur during a 2 hour time during boating within the Patapsco River.
(2) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)

TABLE 5.4.2
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day)=
	CR	Ingestion Rate	L/day	0.01	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	4	BPJ (3)	(4)
	ED	Exposure Duration	yr	10	U.S. EPA 1997b	
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging time-Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	13,350	U.S. EPA 1997b (1)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	For organic compounds
	EF	Exposure Frequency	day/yr	4	BPJ (3)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	10	U.S. EPA 1997b	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	(4)
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DA_{event} = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) The surface body area is averaged for two age ranges: 12 to 16 years and 6 to 11 years.
(2) Swimming is estimate to occur during a 2 hour time during boating within the Patapsco River
(3) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.3
VALUES USED FOR CHILD RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	0.01	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	4	BPJ (2)	(4)
	ED	Exposure Duration	yr	3	BPJ (3)	
	BW	Body Weight	kg	18	U.S. EPA 1989	
	AT-NC	Averaging time-Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (1)	For organic compounds
	EF	Exposure Frequency	day/yr	4	BPJ (2)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	3	BPJ (3)	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging Time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	(4)
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DA_{event} = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) Swimming is estimated to occur during a 2 hour time during boating within the Patapsco River.
(2) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)
(3) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not swim in the Patapsco River.
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.4
VALUES USED FOR WATERMAN DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult - Fishing

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	3,900	U.S. EPA 1997b (1)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	For organic compounds
	EF	Exposure Frequency	day/yr	39	BPJ (3)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	30	U.S. EPA 1989	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DA_{event} = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) The watermen contact would be limited to the hands and forearms arms since contact to surface water is primarily while hauling fishing nets into boat. The arm SA at 2,910 cm^2 and hands at 990 cm^2. This results in an SA of 3,900 cm^2.
(2) Personal communication with USEPA and MDE May 5, 2011
(3) Fishing is expected to occur March through November, for a total of 9 months or 39 weeks. It is expected that a watermen would not fish exclusively in the Patapsco River near the Coke Point offshore environment. The watermen fishes near Coke Point 1 day/week for a total of 39 days/year.

TABLE 5.4.5
VALUES USED FOR ADULT RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,870	BPJ (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	4	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) Contact with sediment will be with the feet and lower legs. For the adult, the lower legs are 2,560 cm^2 and the feet are 1,310 cm^2, with a total of 3,870 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for resident adult exposure to soil.
(3) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)

TABLE 5.4.6
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,870	U.S. EPA 1997b (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	(4)
	EF	Exposure Frequency	event/yr	4	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	10	BPJ	
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) Contact with sediment will be with the feet and lower legs. For the adolescent, the surface area for the adult lower legs are 2,560 cm^2 and the feet are 1,310 cm^2, with a total of 3,870 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for resident child exposure to soil.
(3) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.7
VALUES USED FOR CHILD RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,620	U.S. EPA 2008(1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	(5)
	EF	Exposure Frequency	event/yr	4	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	3	BPJ (4)	
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging Time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake

(1) Contact with sediment will be with the feet and lower legs. For the child, the surface area for the the legs are 2,070 cm^2 and the feet are 550 cm^2, for a total of 2,620 cm^2 (3 to 6 year age range).
(2) The adherence factor is conservatively equal to the recommended factor for resident child exposure to soil.
(3) Swimming will occur only on a limited basis, 4 days/yr. based upon previous RCRA assessment (ISG 2005) and personal communication with US EPA and MDE (USEPA/MDE 2011)
(4) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not swim in the Patapsco River.
(5) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.8
VALUES USED FOR WATERMAN DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,900	U.S. EPA 1997b (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	39	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The watermen contact would be limited to the hands and forearms arms since contact to sediment is primarily while hauling fishing nets into boat. The arm SA at 2,910 cm^2 and hands at 990 cm^2. This results in an SA of 3,900 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for commercial/industrial worker exposure to soil.
(3) Fishing is expected to occur March through November, for a total of 9 months or 39 weeks. It is expected that a watermen would not fish exclusively in the Patapsco River near the Coke Point offshore environment. The watermen fishes near Coke Point 1 day/week for a total of 39 days/year.

TABLE 5.4.9
VALUES USED FOR ADULT RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.23	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adult is 8 ounces/meal or 0.23 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs from the area for 2 days per week during warmer months, June to September (32 Days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area

TABLE 5.4.10
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.17	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	10	BPJ	(3)
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adolescent is 6 ounces/meal or 0.17 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs from the area for 2 days per week during warmer months, June to September (32 Days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area
(3) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.11
VALUES USED FOR CHILD RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.085	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	3	BPJ (3)	(4)
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by a child is 3 ounces/meal or 0.085 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs from the area for 2 days per week during warmer months, June to September (32 Days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area
(3) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not eat catch from the Patapsco River.
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 5.4.12
VALUES USED FOR WATERMAN DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.23	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	39	BPJ (2)	
	ED	Exposure Duration	yr	30	BPJ	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adult is 8 ounces/meal or 0.23 kg/meal (wet weight).
(2) It is assumed that the waterman will ingest fish or catch crabs from the Patapsco River each day they visit the area (39 days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area

TABLE 5.5.1
NON-CANCER TOXICITY DATA - ORAL/DERMAL
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
DIOXIN/FURANS								
DIOXIN (TEQ)	Chronic	1.00E-09	1	1.00E-09	Developmental	90/1	ATSDR	12/1/2009
METALS								
ANTIMONY	Chronic	4.00E-04	0.15	6.00E-05	Blood glucose and cholesterol	1000/1	IRIS	5/6/2010
ARSENIC	Chronic	3.00E-04	1	3.00E-04	Skin	3/1	IRIS	5/6/2010
CADMIUM	Chronic	1.00E-03	0.25	2.50E-04	Kidneys	10/1	IRIS	5/6/2010
COBALT	Chronic	3.00E-04	1	3.00E-04	Blood	10/1	PPTRV	7/20/2007
COPPER	Chronic	4.00E-02	1	4.00E-02	Gastrointestinal System	NA/NA	HEAST	1997
MERCURY	Chronic	1.00E-04	1	1.00E-04	Central Nervous System	10/1	IRIS	5/6/2010
SELENIUM	Chronic	5.00E-03	1	5.00E-03	Hair and Skin	3/1	IRIS	5/6/2010
ZINC	Chronic	3.00E-01	1	3.00E-01	Blood	3/1	IRIS	5/6/2010
PAHS								
BENZO(A)ANTHRACENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(B)FLUORANTHENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(K)FLUORANTHENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(A)PYRENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
CHRYSENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
DIBENZ(A,H)ANTHRACENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
INDENO(1,2,3-C,D)PYRENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
NAPHTHALENE	Chronic	2.00E-02	1	2.00E-02	Developmental System	3000/1	IRIS	5/6/2010
PCB CONGENERS								
TOTAL PCB's	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
VOLATILES								
BENZENE	Chronic	4.00E-03	1	4.00E-03	Liver	300/1	IRIS	5/6/2010

NA = Not Applicable

(1) Taken from USEPA 2004 Guidance.

(2) Dermal toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer-Reviewed Toxicity Value. For PPRTV values, the date of the issue paper is provided.
CalEPA - Calfornia Environmental Protection Agency. For CalEPA values, the date searched is provided.
ATSDR - Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL).

TABLE 5.5.2
CHEMICAL-SPECIFIC PARAMETERS
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Absorption Factor	Reference	GI ABS	Reference	Permeability Constant (cm/hr)	Reference
Dioxin/Furans						
DIOXIN (TEQ)	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	8.10E-01	U.S. EPA 2004
Inorganics						
ANTIMONY	0.01	U.S. EPA, 2003c	0.15	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
ARSENIC	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
CADMIUM	0.001	U.S. EPA, 2004	0.25	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
COBALT	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	4.00E-04	U.S. EPA 2004
COPPER	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
MERCURY	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
SELENIUM	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	9.03E-04	U.S. EPA 2004
ZINC	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	6.00E-04	U.S. EPA 2004
PAHs						
BENZ(A)ANTHRACENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-01	U.S. EPA 2004
BENZO(B)FLUORANTHENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	7.00E-01	U.S. EPA 2004
BENZO(K)FLUORANTHENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	6.91E-01	On-line Database(1)
BENZO(A)PYRENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	7.00E-01	U.S. EPA 2004
CHRYSENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-01	U.S. EPA 2004
DIBENZ(A,H)ANTHRACENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	1.50E+00	U.S. EPA 2004
INDENO(1,2,3-C,D)PYRENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E+00	U.S. EPA 2004
NAPHTHALENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-02	U.S. EPA 2004
Pesticides/PCBs						
TOTAL PCB's	0.14	U.S. EPA, 2004	1	U.S. EPA, 2004	4.30E-01	U.S. EPA 2004
Volatiles						
BENZENE	0.0005	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.50E-02	U.S. EPA 2004

NA = Data not available.
GI ABS = Gastrointestional Absorption factors
(1) Toxicity and Chemical-Specific Factors Database. Http://risk.lsd.ornl.gov/cgi-bin/tox. May 2010.
U.S. EPA, 2004 = U.S. Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Final Guidance.

TABLE 5.6
CANCER TOXICITY DATA - ORAL/DERMAL
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS)(1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/Cancer Guideline Description	Mutagenic Compound	Source	Date (3) (mm/dd/yy)
Dioxin/Furans								
DIOXIN (TEQ)	1.30E+05	1	1.50E+05	per (mg/kg-day)	B2		CalEPA	5/1/2009
Inorganics								
ANTIMONY	NA	0.15	NA	per (mg/kg-day)	NA		IRIS	5/6/2010
ARSENIC	1.50E+00	1	1.50E+00	per (mg/kg-day)	A		IRIS	5/6/2010
CADMIUM	NA	0.25	NA	per (mg/kg-day)	NA		IRIS	5/6/2010
COBALT	NA	1	NA	per (mg/kg-day)	NA		PPTRV	7/20/2007
COPPER	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
MERCURY	NA	1	NA	per (mg/kg-day)	C		IRIS	5/6/2010
SELENIUM	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
ZINC	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
PAHs								
BENZ(A)ANTHRACENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(B)FLUORANTHENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(K)FLUORANTHENE	7.30E-02	1	7.30E-02	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(A)PYRENE	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	M	IRIS	5/6/2010
CHRYSENE	7.30E-03	1	7.30E-03	per (mg/kg-day)	B2	M	IRIS	5/6/2010
DIBENZ(A,H)ANTHRACENE	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	M	IRIS	5/6/2010
INDENO(1,2,3-C,D)PYRENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
NAPHTHALENE	NA	1	NA	per (mg/kg-day)	C		IRIS	5/6/2010
Pesticides/PCBs								
TOTAL PCB's	2.00E+00	1	2.00E+00	per (mg/kg-day)	B2		IRIS	5/6/2010
Volatiles								
BENZENE	5.50E-02	1	5.50E-02	per (mg/kg-day)	A		IRIS	5/6/2010

M = Chemical has a mutagenic mode of action
NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal Toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article is provided .
PPRTV - Provisional Peer-Reviewed Toxicity Value. For PPRTV values, the date of the issue paper is provided.
CalEPA - Calfornia Environmental Protection Agency.
NJDEP - New Jersey Department of Environmental Protection.

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 5.7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	1.41E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	2.12E-09	3.30E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	3.30E-05
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	1.51E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.26E-08	3.52E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.17E-04
				CADMIUM	2.97E+00	(mg/kg)	5.39E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	1.26E-10	(mg/kg-day)	2.50E-04	(mg/kg-day)	5.03E-07
				COBALT	2.94E+01	(mg/kg)	5.33E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.24E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.15E-05
				COPPER	1.72E+02	(mg/kg)	3.13E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.29E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.82E-06
				SELENIUM	4.61E+00	(mg/kg)	8.39E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.96E-09	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.91E-07
				ZINC	9.99E+02	(mg/kg)	1.82E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.24E-07	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.41E-06
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	3.23E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.36E-08	7.53E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	2.99E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.18E-08	6.98E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	2.96E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.16E-07	6.91E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	5.81E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.24E-08	1.35E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	1.65E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.20E-08	3.84E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	2.15E+03	(mg/kg)	5.08E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.18E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.92E-04
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	6.74E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.35E-09	1.57E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	7.18E-13	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.95E-14	1.68E-12	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.19E-10
			Exp. Route Total								**3.42E-07**					**7.88E-04**
		Exposure Point Total									**3.42E-07**					**7.88E-04**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	3.76E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	4.89E-05	8.77E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	8.77E-01
				METALS												
				ARSENIC	1.22E-01	(mg/kg)	7.53E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.13E-05	1.76E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.86E-02
				CADMIUM	1.51E-01	(mg/kg)	9.32E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.17E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.17E-02
				COBALT	1.26E-01	(mg/kg)	7.78E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.05E-02
				COPPER	1.07E+01	(mg/kg)	6.60E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.54E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.85E-02
				SELENIUM	1.00E+00	(mg/kg)	6.17E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.44E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.88E-02
				ZINC	4.59E+01	(mg/kg)	2.83E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	6.61E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.20E-02
				PAHS												
				BENZO(B)FLUORANTHENE	2.77E-02	(mg/kg)	1.71E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.25E-06	3.99E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.85E-03	(mg/kg)	2.99E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.19E-06	6.99E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	1.60E-02	(mg/kg)	9.88E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.30E-06	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.15E-04
				PCB CONGENERS												
				TOTAL PCB's	1.99E-01	(mg/kg)	1.23E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.46E-05	2.87E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	4.88E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.68E-07	1.14E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.84E-03
			Exp. Route Total								**8.84E-05**					**1.11E+00**
		Exposure Point Total									**8.84E-05**					**1.11E+00**
	Exposure Medium Total										**8.88E-05**					**1.11E+00**
Sediment Total											**8.88E-05**					**1.11E+00**

TABLE 5.7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	5.88E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.82E-09	1.37E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.57E-05
				MERCURY	5.73E-05	(mg/L)	7.69E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	1.79E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.79E-06
				SELENIUM	1.35E-02	(mg/L)	1.81E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.22E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.44E-06
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.32E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.60E-10	3.07E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	1.32E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.64E-10	3.08E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	1.37E-09	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.00E-10	3.20E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	1.02E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.44E-09	2.38E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.46E-09	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.06E-11	3.40E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.64E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.20E-08	3.82E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	1.55E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.13E-09	3.62E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	1.67E-08	(mg/kg-day)	5.50E-02	per (mg/kg-day)	9.21E-10	3.91E-08	(mg/kg-day)	4.00E-03	(mg/kg-day)	9.77E-06
			Exp. Route Total								**3.23E-08**					**6.57E-05**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.06E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.59E-08	2.47E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.23E-05
				MERCURY	5.73E-05	(mg/L)	1.38E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	3.23E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.23E-06
				SELENIUM	1.35E-02	(mg/L)	2.94E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.86E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.37E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	3.07E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.24E-06	7.17E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	5.36E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.92E-06	1.25E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	5.57E-06	(mg/kg-day)	7.30E-02	per (mg/kg-day)	4.06E-07	1.30E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	4.08E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.98E-05	9.51E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	3.40E-06	(mg/kg-day)	7.30E-03	per (mg/kg-day)	2.48E-08	7.94E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.01E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.39E-05	2.36E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	6.30E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.60E-06	1.47E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	5.67E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.12E-08	1.32E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.31E-04
			Exp. Route Total								**1.15E-04**					**4.30E-04**
		Exposure Point Total									**1.15E-04**					**4.96E-04**
		Finfish	Ingestion	**METALS**												
				ARSENIC	4.43E-02	(mg/kg)	2.74E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.11E-06	6.39E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.13E-02
				MERCURY	5.55E-02	(mg/kg)	3.43E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	7.99E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.99E-02
				SELENIUM	9.25E-01	(mg/kg)	5.71E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.33E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.67E-02
				PCB CONGENERS												
				TOTAL PCB's	2.00E-01	(mg/kg)	1.23E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.47E-05	2.88E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	9.07E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	4.99E-07	2.12E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.29E-03
			Exp. Route Total								**2.93E-05**					**1.33E-01**
		Exposure Point Total									**2.93E-05**					**1.33E-01**
	Exposure Medium Total										**1.44E-04**					**1.34E-01**
Surface Water Total											**1.44E-04**					**1.34E-01**
										Total of Receptor Risks Across All Media	**2.33E-04**				Total of Receptor Hazards Across All Media	**1.24E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab. Please see Table 5.1 for inorganic arsenic percentages.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Table 5.5.2 presents dermal ABS values.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	2.09E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	3.14E-09	1.46E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.46E-04
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	2.23E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.35E-08	1.56E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.21E-04
				CADMIUM	2.97E+00	(mg/kg)	7.99E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	5.59E-10	(mg/kg-day)	2.50E-04	(mg/kg-day)	2.24E-06
				COBALT	2.94E+01	(mg/kg)	7.90E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	5.53E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.84E-04
				COPPER	1.72E+02	(mg/kg)	4.63E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	3.24E-07	(mg/kg-day)	4.00E-02	(mg/kg-day)	8.11E-06
				SELENIUM	4.61E+00	(mg/kg)	1.24E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	8.70E-09	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.74E-06
				ZINC	9.99E+02	(mg/kg)	2.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.88E-06	(mg/kg-day)	3.00E-01	(mg/kg-day)	6.28E-06
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	1.43E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.05E-07	3.35E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	1.33E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.71E-08	3.10E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	1.32E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.61E-07	3.07E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	2.58E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.88E-07	6.02E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	7.32E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.34E-08	1.71E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	2.15E+03	(mg/kg)	7.52E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.27E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.63E-03
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	9.99E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.00E-09	6.99E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	1.06E-12	(mg/kg-day)	5.50E-02	per (mg/kg-day)	5.85E-14	7.45E-12	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.86E-09
			Exp. Route Total								**1.44E-06**					**3.50E-03**
		Exposure Point Total									**1.44E-06**					**3.50E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	1.44E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.87E-05	1.01E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.01E+00
				METALS												
				ARSENIC	1.22E-01	(mg/kg)	2.89E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.33E-06	2.02E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.73E-02
				CADMIUM	1.51E-01	(mg/kg)	3.57E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.50E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.50E-02
				COBALT	1.26E-01	(mg/kg)	2.98E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.09E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.96E-02
				COPPER	1.07E+01	(mg/kg)	2.53E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.77E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.43E-02
				SELENIUM	1.00E+00	(mg/kg)	2.37E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.66E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.31E-02
				ZINC	4.59E+01	(mg/kg)	1.09E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	7.60E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.53E-02
				PAHS												
				BENZO(B)FLUORANTHENE	2.77E-02	(mg/kg)	1.97E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.44E-06	4.59E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.85E-03	(mg/kg)	3.44E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.51E-06	8.03E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	1.60E-02	(mg/kg)	3.79E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.65E-06	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.32E-04
				PCB CONGENERS												
				TOTAL PCB's	1.99E-01	(mg/kg)	4.71E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	9.42E-06	3.30E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	1.87E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.03E-07	1.31E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.27E-03
			Exp. Route Total								**3.65E-05**					**1.28E+00**
		Exposure Point Total									**3.65E-05**					**1.28E+00**
	Exposure Medium Total										**3.80E-05**					**1.28E+00**
Sediment Total											**3.80E-05**					**1.28E+00**

TABLE 5.7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.52E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.29E-09	1.07E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.56E-05
				MERCURY	5.73E-05	(mg/L)	1.99E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	1.40E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.40E-06
				SELENIUM	1.35E-02	(mg/L)	4.69E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.28E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.56E-06
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.02E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.47E-10	2.39E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	1.03E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.50E-10	2.40E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	1.07E-09	(mg/kg-day)	7.30E-02	per (mg/kg-day)	7.78E-11	2.49E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	7.92E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.78E-09	1.85E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.13E-09	(mg/kg-day)	7.30E-03	per (mg/kg-day)	8.27E-12	2.64E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.27E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.30E-09	2.97E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	1.21E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.81E-10	2.82E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	4.34E-09	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.39E-10	3.04E-08	(mg/kg-day)	4.00E-03	(mg/kg-day)	7.60E-06
			Exp. Route Total								**2.01E-08**					**5.11E-05**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	4.07E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.10E-09	2.85E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.49E-05
				MERCURY	5.73E-05	(mg/L)	5.32E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	3.73E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.73E-06
				SELENIUM	1.35E-02	(mg/L)	1.13E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.91E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.58E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	3.54E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.59E-06	8.27E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	6.19E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.52E-06	1.44E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	6.42E-06	(mg/kg-day)	7.30E-02	per (mg/kg-day)	4.69E-07	1.50E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	4.70E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.43E-05	1.10E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	3.92E-06	(mg/kg-day)	7.30E-03	per (mg/kg-day)	2.86E-08	9.16E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.17E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.52E-05	2.72E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	7.27E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.31E-06	1.70E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	2.18E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.20E-08	1.53E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.82E-04
			Exp. Route Total								**1.32E-04**					**4.96E-04**
		Exposure Point Total									**1.32E-04**					**5.47E-04**
		Finfish	Ingestion	**METALS**												
				ARSENIC	4.43E-02	(mg/kg)	1.05E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.57E-06	7.34E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.45E-02
				MERCURY	5.55E-02	(mg/kg)	1.31E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	9.19E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.19E-02
				SELENIUM	9.25E-01	(mg/kg)	2.19E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.53E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.06E-02
				PCB CONGENERS												
				TOTAL PCB's	2.00E-01	(mg/kg)	4.73E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	9.46E-06	3.31E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	3.48E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.91E-07	2.43E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.09E-03
			Exp. Route Total								**1.12E-05**					**1.53E-01**
		Exposure Point Total									**1.12E-05**					**1.53E-01**
	Exposure Medium Total										**1.44E-04**					**1.54E-01**
Surface Water Total											**1.44E-04**					**1.54E-01**
										Total of Receptor Risks Across All Media	**1.82E-04**				Total of Receptor Hazards Across All Media	**1.43E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 5.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	1.06E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.59E-09	2.48E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.48E-04
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	1.13E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.70E-08	2.65E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.82E-04
				CADMIUM	2.97E+00	(mg/kg)	4.06E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	9.47E-10	(mg/kg-day)	2.50E-04	(mg/kg-day)	3.79E-06
				COBALT	2.94E+01	(mg/kg)	4.01E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	9.36E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.12E-04
				COPPER	1.72E+02	(mg/kg)	2.35E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.49E-07	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.37E-05
				SELENIUM	4.61E+00	(mg/kg)	6.31E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.47E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.94E-06
				ZINC	9.99E+02	(mg/kg)	1.37E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.19E-06	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.06E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	7.28E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.32E-08	5.67E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	6.75E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.93E-08	5.25E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	6.69E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.88E-07	5.20E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	1.31E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.56E-08	1.02E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	3.72E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.71E-08	2.89E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	2.15E+03	(mg/kg)	3.82E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	8.91E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.46E-03
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	5.07E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.01E-09	1.18E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	5.40E-13	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.97E-14	1.26E-11	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.15E-09
			Exp. Route Total								**7.33E-07**					**5.93E-03**
		Exposure Point Total									**7.33E-07**					**5.93E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	5.40E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	7.02E-06	1.26E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.26E+00
				METALS												
				ARSENIC	1.22E-01	(mg/kg)	1.08E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.62E-06	2.53E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.42E-02
				CADMIUM	1.51E-01	(mg/kg)	1.34E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.13E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	3.13E-02
				COBALT	1.26E-01	(mg/kg)	1.12E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.61E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.69E-02
				COPPER	1.07E+01	(mg/kg)	9.49E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.21E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	5.54E-02
				SELENIUM	1.00E+00	(mg/kg)	8.87E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.07E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.14E-02
				ZINC	4.59E+01	(mg/kg)	4.07E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.50E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	3.17E-02
				PAHS												
				BENZO(B)FLUORANTHENE	2.77E-02	(mg/kg)	7.37E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.38E-07	5.73E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.85E-03	(mg/kg)	1.29E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.42E-07	1.00E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	1.60E-02	(mg/kg)	1.42E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.31E-06	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.66E-04
				PCB CONGENERS												
				TOTAL PCB's	1.99E-01	(mg/kg)	1.77E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.53E-06	4.12E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	7.01E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.85E-08	1.64E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.09E-03
			Exp. Route Total								**1.37E-05**					**1.60E+00**
		Exposure Point Total									**1.37E-05**					**1.60E+00**
	Exposure Medium Total										**1.44E-05**					**1.60E+00**
Sediment Total											**1.44E-05**					**1.60E+00**

TABLE 5.7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.14E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.71E-09	2.67E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.89E-05
				MERCURY	5.73E-05	(mg/L)	1.50E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	3.49E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.49E-06
				SELENIUM	1.35E-02	(mg/L)	3.51E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	8.20E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.64E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	7.67E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.60E-10	5.97E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	7.70E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.62E-10	5.99E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	7.99E-10	(mg/kg-day)	7.30E-02	per (mg/kg-day)	5.83E-11	6.22E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	5.94E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.34E-09	4.62E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	8.49E-10	(mg/kg-day)	7.30E-03	per (mg/kg-day)	6.20E-12	6.61E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	9.55E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.97E-09	7.43E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	9.05E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.61E-10	7.04E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	3.26E-09	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.79E-10	7.60E-08	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.90E-05
			Exp. Route Total								**1.50E-08**					**1.28E-04**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.51E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.26E-09	3.52E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.17E-04
				MERCURY	5.73E-05	(mg/L)	1.97E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	4.60E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	4.60E-06
				SELENIUM	1.35E-02	(mg/L)	4.19E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	9.78E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.96E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.31E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.59E-07	1.02E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	2.29E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.67E-06	1.78E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	2.38E-06	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.74E-07	1.85E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	1.74E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.27E-05	1.36E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.46E-06	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.06E-08	1.13E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	4.33E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.16E-05	3.37E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	2.70E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.97E-06	2.10E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	8.09E-08	(mg/kg-day)	5.50E-02	per (mg/kg-day)	4.45E-09	1.89E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.72E-04
			Exp. Route Total								**4.91E-05**					**6.13E-04**
		Exposure Point Total									**4.91E-05**					**7.41E-04**
		Finfish	Ingestion	**METALS**												
				ARSENIC	4.43E-02	(mg/kg)	3.93E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.90E-07	9.18E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.06E-02
				MERCURY	5.55E-02	(mg/kg)	4.92E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.15E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.15E-01
				SELENIUM	9.25E-01	(mg/kg)	8.21E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.92E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.83E-02
				PCB CONGENERS												
				TOTAL PCB's	2.00E-01	(mg/kg)	1.77E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.55E-06	4.14E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	1.30E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.17E-08	3.04E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	7.61E-03
			Exp. Route Total								**4.21E-06**					**1.91E-01**
		Exposure Point Total									**4.21E-06**					**1.91E-01**
	Exposure Medium Total										**5.33E-05**					**1.92E-01**
Surface Water Total											**5.33E-05**					**1.92E-01**
										Total of Receptor Risks Across All Media	**6.78E-05**				Total of Receptor Hazards Across All Media	**1.79E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab. Please see Table 5.1 for inorganic arsenic percentages.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Table 5.5.2 presents dermal ABS values.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	3.96E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	5.95E-08	9.25E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	9.25E-04
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	4.23E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.35E-07	9.87E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.29E-03
				CADMIUM	2.97E+00	(mg/kg)	1.51E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.53E-09	(mg/kg-day)	2.50E-04	(mg/kg-day)	1.41E-05
				COBALT	2.94E+01	(mg/kg)	1.50E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.49E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.16E-03
				COPPER	1.72E+02	(mg/kg)	8.78E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.05E-06	(mg/kg-day)	4.00E-02	(mg/kg-day)	5.12E-05
				SELENIUM	4.61E+00	(mg/kg)	2.35E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.49E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.10E-05
				ZINC	9.99E+02	(mg/kg)	5.10E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.19E-05	(mg/kg-day)	3.00E-01	(mg/kg-day)	3.97E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	9.06E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.61E-07	2.11E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	8.40E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.13E-07	1.96E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	8.32E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.07E-06	1.94E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	1.63E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.19E-06	3.80E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	4.62E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.37E-07	1.08E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	2.15E+03	(mg/kg)	1.43E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.33E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.66E-02
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	1.89E-08	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.79E-08	4.42E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	2.02E-11	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.11E-12	4.70E-11	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.18E-08
			Exp. Route Total								**9.61E-06**					**2.21E-02**
		Exposure Point Total									**9.61E-06**					**2.21E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	4.58E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	5.96E-05	1.07E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.07E+00
				METALS												
				ARSENIC	1.22E-01	(mg/kg)	9.18E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.38E-05	2.14E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.14E-02
				CADMIUM	1.51E-01	(mg/kg)	1.14E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.65E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.65E-02
				COBALT	1.26E-01	(mg/kg)	9.48E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.21E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.37E-02
				COPPER	1.07E+01	(mg/kg)	8.05E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.88E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.70E-02
				SELENIUM	1.00E+00	(mg/kg)	7.52E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.51E-02
				ZINC	4.59E+01	(mg/kg)	3.45E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	8.06E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.69E-02
				PAHS												
				BENZO(B)FLUORANTHENE	2.77E-02	(mg/kg)	2.08E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.52E-06	4.86E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.85E-03	(mg/kg)	3.65E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.66E-06	8.51E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				NAPHTHALENE	1.60E-02	(mg/kg)	1.20E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.81E-06	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.40E-04
				PCB CONGENERS												
				TOTAL PCB's	1.99E-01	(mg/kg)	1.50E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.99E-05	3.49E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	5.94E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.27E-07	1.39E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.47E-03
			Exp. Route Total								**1.08E-04**					**1.35E+00**
		Exposure Point Total									**1.08E-04**					**1.35E+00**
	Exposure Medium Total										**1.17E-04**					**1.38E+00**
Sediment Total											**1.17E-04**					**1.38E+00**

TABLE 5.7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	2.23E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.35E-08	5.21E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.74E-04
				MERCURY	5.73E-05	(mg/L)	2.92E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	6.82E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	6.82E-06
				SELENIUM	1.35E-02	(mg/L)	6.21E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.45E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.90E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	6.49E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.74E-06	1.51E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	1.13E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.27E-06	2.64E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	1.18E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	8.58E-07	2.74E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	8.61E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.29E-05	2.01E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	7.19E-06	(mg/kg-day)	7.30E-03	per (mg/kg-day)	5.25E-08	1.68E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	2.14E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.56E-04	4.99E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	1.33E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.72E-06	3.11E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	1.20E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	6.59E-08	2.79E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.99E-04
			Exp. Route Total								**2.43E-04**					**9.08E-04**
		Exposure Point Total									**2.43E-04**					**9.08E-04**
		Finfish	Ingestion	**METALS**												
				ARSENIC	4.43E-02	(mg/kg)	3.34E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.00E-06	7.78E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.59E-02
				MERCURY	5.55E-02	(mg/kg)	4.17E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	9.74E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.74E-02
				SELENIUM	9.25E-01	(mg/kg)	6.96E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.62E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.25E-02
				PCB CONGENERS												
				TOTAL PCB's	2.00E-01	(mg/kg)	1.50E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.01E-05	3.51E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	1.11E-05	(mg/kg-day)	5.50E-02	per (mg/kg-day)	6.08E-07	2.58E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.45E-03
			Exp. Route Total								**3.57E-05**					**1.62E-01**
		Exposure Point Total									**3.57E-05**					**1.62E-01**
	Exposure Medium Total										**2.78E-04**					**1.63E-01**
Surface Water Total											**2.78E-04**					**1.63E-01**
										Total of Receptor Risks Across All Media	**3.96E-04**				Total of Receptor Hazards Across All Media	**1.54E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 5.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	4.45E-15	(mg/kg-day)	1.50E+05	per (mg/kg-day)	6.68E-10	1.04E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.04E-05
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	5.84E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.76E-09	1.36E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.54E-05
				CADMIUM	1.35E+00	(mg/kg)	2.45E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	5.73E-11	(mg/kg-day)	2.50E-05	(mg/kg-day)	2.29E-06
				COBALT	1.98E+01	(mg/kg)	3.60E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	8.40E-09	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.80E-05
				COPPER	9.16E+01	(mg/kg)	1.66E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	3.88E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	9.71E-07
				MERCURY	2.27E-01	(mg/kg)	4.13E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	9.63E-11	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.63E-07
				SELENIUM	2.40E+00	(mg/kg)	4.36E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.02E-09	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.04E-07
				ZINC	3.76E+02	(mg/kg)	6.83E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-07	(mg/kg-day)	3.00E-01	(mg/kg-day)	5.32E-07
				PAHS												
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	2.60E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.90E-08	6.06E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	1.35E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.71E-10	3.16E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**2.87E-08**					**8.88E-05**
		Exposure Point Total									**2.87E-08**					**8.88E-05**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	3.75E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	4.88E-06	8.76E-11	(mg/kg-day)	1.00E-09	(mg/kg-day)	8.76E-02
				METALS												
				ARSENIC	1.26E-01	(mg/kg)	7.78E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.17E-05	1.81E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.05E-02
				CADMIUM	1.85E-01	(mg/kg)	1.14E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.66E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.66E-02
				COBALT	1.23E-01	(mg/kg)	7.59E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.77E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.91E-02
				COPPER	1.44E+01	(mg/kg)	8.89E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.07E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	5.19E-02
				MERCURY	2.36E-02	(mg/kg)	1.46E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.40E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.40E-02
				SELENIUM	1.10E+00	(mg/kg)	6.79E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.58E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.17E-02
				ZINC	4.69E+01	(mg/kg)	2.90E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	6.76E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.25E-02
				PCB CONGENERS												
				TOTAL PCB's	2.72E-01	(mg/kg)	1.68E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.36E-05	3.92E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.01E-05**					**3.74E-01**
		Exposure Point Total									**5.01E-05**					**3.74E-01**
	Exposure Medium Total										**5.02E-05**					**3.74E-01**
Sediment Total											**5.02E-05**					**3.74E-01**

TABLE 5.7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	3.40E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	7.92E-10	(mg/kg-day)	4.00E-04	(mg/kg-day)	1.98E-06
				ARSENIC	4.69E-03	(mg/L)	6.29E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.44E-09	1.47E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.89E-05
				COPPER	2.35E-03	(mg/L)	3.15E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	7.36E-09	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.84E-07
				MERCURY	3.90E-05	(mg/L)	5.23E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	1.22E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.22E-06
				SELENIUM	1.26E-02	(mg/L)	1.69E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	3.95E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	7.89E-06
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.88E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.37E-10	4.38E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	6.84E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.00E-10	1.60E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	9.80E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.15E-10	2.29E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	9.80E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.15E-11	2.29E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.09E-08**					**6.02E-05**
			Dermal	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	6.11E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.43E-09	(mg/kg-day)	6.00E-05	(mg/kg-day)	2.38E-05
				ARSENIC	4.69E-03	(mg/L)	1.13E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.70E-08	2.64E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.81E-05
				COPPER	2.35E-03	(mg/L)	5.68E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.32E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.31E-07
				MERCURY	3.90E-05	(mg/L)	9.42E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	2.20E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.20E-06
				SELENIUM	1.26E-02	(mg/L)	2.75E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.41E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.28E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	4.39E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.20E-07	1.02E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	2.74E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.00E-06	6.39E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	6.05E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.42E-06	1.41E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	3.98E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.91E-07	9.29E-07	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**7.11E-06**					**1.27E-04**
		Exposure Point Total									**7.12E-06**					**1.87E-04**
		Finfish	Ingestion	**METALS**												
				ANTIMONY	6.09E-02	(mg/kg)	3.76E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	8.77E-06	(mg/kg-day)	4.00E-04	(mg/kg-day)	2.19E-02
				ARSENIC	5.62E-02	(mg/kg)	3.47E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.20E-06	8.09E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.70E-02
				COPPER	9.10E+00	(mg/kg)	5.62E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.31E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.28E-02
				MERCURY	4.60E-02	(mg/kg)	2.84E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	6.63E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	6.63E-02
				SELENIUM	1.00E+00	(mg/kg)	6.19E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.44E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.89E-02
				PCB CONGENERS												
				TOTAL PCB's	2.90E-01	(mg/kg)	1.79E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.58E-05	4.18E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**4.10E-05**					**1.77E-01**
		Exposure Point Total									**4.10E-05**					**1.77E-01**
	Exposure Medium Total										**4.81E-05**					**1.77E-01**
Surface Water Total											**4.81E-05**					**1.77E-01**
										Total of Receptor Risks Across All Media	**9.83E-05**				Total of Receptor Hazards Across All Media	**5.51E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	6.60E-15	(mg/kg-day)	1.50E+05	per (mg/kg-day)	9.90E-10	4.62E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	4.62E-05
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	8.65E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.30E-08	6.06E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.02E-04
				CADMIUM	1.35E+00	(mg/kg)	3.64E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	2.54E-10	(mg/kg-day)	2.50E-05	(mg/kg-day)	1.02E-05
				COBALT	1.98E+01	(mg/kg)	5.33E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.73E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.24E-04
				COPPER	9.16E+01	(mg/kg)	2.47E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.73E-07	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.32E-06
				MERCURY	2.27E-01	(mg/kg)	6.11E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	4.28E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	4.28E-06
				SELENIUM	2.40E+00	(mg/kg)	6.46E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	4.52E-09	(mg/kg-day)	5.00E-03	(mg/kg-day)	9.05E-07
				ZINC	3.76E+02	(mg/kg)	1.01E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	7.09E-07	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.36E-06
				PAHS												
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	1.16E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.43E-08	2.70E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	2.01E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.01E-10	1.40E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**9.87E-08**					**3.95E-04**
		Exposure Point Total									**9.87E-08**					**3.95E-04**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	1.44E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.87E-06	1.01E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.01E-01
				METALS												
				ARSENIC	1.26E-01	(mg/kg)	2.98E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.47E-06	2.09E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.96E-02
				CADMIUM	1.85E-01	(mg/kg)	4.38E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.06E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	3.06E-02
				COBALT	1.23E-01	(mg/kg)	2.91E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.04E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.79E-02
				COPPER	1.44E+01	(mg/kg)	3.41E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.38E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	5.96E-02
				MERCURY	2.36E-02	(mg/kg)	5.58E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.91E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.91E-02
				SELENIUM	1.10E+00	(mg/kg)	2.60E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.82E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.64E-02
				ZINC	4.69E+01	(mg/kg)	1.11E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	7.77E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.59E-02
				PCB CONGENERS												
				TOTAL PCB's	2.72E-01	(mg/kg)	6.43E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.29E-05	4.50E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.92E-05**					**4.30E-01**
		Exposure Point Total									**1.92E-05**					**4.30E-01**
	Exposure Medium Total										**1.93E-05**					**4.30E-01**
Sediment Total											**1.93E-05**					**4.30E-01**

TABLE 5.7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	8.80E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	6.16E-10	(mg/kg-day)	4.00E-04	(mg/kg-day)	1.54E-06
				ARSENIC	4.69E-03	(mg/L)	1.63E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.45E-09	1.14E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.81E-05
				COPPER	2.35E-03	(mg/L)	8.18E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	5.72E-09	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.43E-07
				MERCURY	3.90E-05	(mg/L)	1.36E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	9.50E-11	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.50E-07
				SELENIUM	1.26E-02	(mg/L)	4.38E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.07E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.14E-06
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.46E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.07E-10	3.41E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	5.32E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.89E-10	1.24E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	7.62E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.56E-10	1.78E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	7.62E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.56E-11	1.78E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.55E-09**					**4.68E-05**
			Dermal	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	2.35E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.65E-09	(mg/kg-day)	6.00E-05	(mg/kg-day)	2.74E-05
				ARSENIC	4.69E-03	(mg/L)	4.36E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.53E-09	3.05E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.02E-04
				COPPER	2.35E-03	(mg/L)	2.18E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.53E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.82E-07
				MERCURY	3.90E-05	(mg/L)	3.62E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	2.54E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.54E-06
				SELENIUM	1.26E-02	(mg/L)	1.06E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.40E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.48E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	5.06E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.70E-07	1.18E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	3.16E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.31E-06	7.37E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	6.98E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.10E-06	1.63E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	4.59E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.35E-07	1.07E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.19E-06**					**1.47E-04**
		Exposure Point Total									**8.19E-06**					**1.94E-04**
		Finfish	Ingestion	**METALS**												
				ANTIMONY	6.09E-02	(mg/kg)	1.44E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.01E-05	(mg/kg-day)	4.00E-04	(mg/kg-day)	2.52E-02
				ARSENIC	5.62E-02	(mg/kg)	1.33E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.99E-06	9.31E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.10E-02
				COPPER	9.10E+00	(mg/kg)	2.15E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.51E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.77E-02
				MERCURY	4.60E-02	(mg/kg)	1.09E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	7.62E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.62E-02
				SELENIUM	1.00E+00	(mg/kg)	2.37E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.66E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.32E-02
				PCB CONGENERS												
				TOTAL PCB's	2.90E-01	(mg/kg)	6.86E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.37E-05	4.80E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.57E-05**					**2.03E-01**
		Exposure Point Total									**1.57E-05**					**2.03E-01**
	Exposure Medium Total										**2.39E-05**					**2.04E-01**
Surface Water Total											**2.39E-05**					**2.04E-01**
										Total of Receptor Risks Across All Media	**4.32E-05**				Total of Receptor Hazards Across All Media	**6.34E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	3.35E-15	(mg/kg-day)	1.50E+05	per (mg/kg-day)	5.02E-10	7.82E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	7.82E-05
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	4.39E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.59E-09	1.03E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.42E-04
				CADMIUM	1.35E+00	(mg/kg)	1.85E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	4.31E-10	(mg/kg-day)	2.50E-05	(mg/kg-day)	1.72E-05
				COBALT	1.98E+01	(mg/kg)	2.71E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	6.32E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.11E-04
				COPPER	9.16E+01	(mg/kg)	1.25E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.92E-07	(mg/kg-day)	4.00E-02	(mg/kg-day)	7.31E-06
				MERCURY	2.27E-01	(mg/kg)	3.10E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	7.24E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.24E-06
				SELENIUM	2.40E+00	(mg/kg)	3.28E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	7.66E-09	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.53E-06
				ZINC	3.76E+02	(mg/kg)	5.14E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.20E-06	(mg/kg-day)	3.00E-01	(mg/kg-day)	4.00E-06
				PAHS												
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	5.87E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.28E-08	4.56E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	1.02E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.04E-10	2.38E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.01E-08**					**6.68E-04**
		Exposure Point Total									**5.01E-08**					**6.68E-04**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	5.39E-12	(mg/kg-day)	1.30E+05	per (mg/kg-day)	7.01E-07	1.26E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.26E-01
				METALS												
				ARSENIC	1.26E-01	(mg/kg)	1.12E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.68E-06	2.61E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.69E-02
				CADMIUM	1.85E-01	(mg/kg)	1.64E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.83E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	3.83E-02
				COBALT	1.23E-01	(mg/kg)	1.09E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.55E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.49E-02
				COPPER	1.44E+01	(mg/kg)	1.28E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.98E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	7.45E-02
				MERCURY	2.36E-02	(mg/kg)	2.09E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.89E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	4.89E-02
				SELENIUM	1.10E+00	(mg/kg)	9.76E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.28E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.55E-02
				ZINC	4.69E+01	(mg/kg)	4.16E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.71E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	3.24E-02
				PCB CONGENERS												
				TOTAL PCB's	2.72E-01	(mg/kg)	2.41E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.83E-06	5.63E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**7.20E-06**					**5.37E-01**
		Exposure Point Total									**7.20E-06**					**5.37E-01**
	Exposure Medium Total										**7.25E-06**					**5.38E-01**
Sediment Total											**7.25E-06**					**5.38E-01**

TABLE 5.7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	2.64E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	6.16E-10	(mg/kg-day)	4.00E-04	(mg/kg-day)	1.54E-06
				ARSENIC	4.69E-03	(mg/L)	4.89E-10	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.34E-10	1.14E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.81E-05
				COPPER	2.35E-03	(mg/L)	2.45E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	5.72E-09	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.43E-07
				MERCURY	3.90E-05	(mg/L)	4.07E-12	(mg/kg-day)	NA	per (mg/kg-day)	--	9.50E-11	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.50E-07
				SELENIUM	1.26E-02	(mg/L)	1.32E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.07E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.14E-06
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	4.38E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.20E-11	3.41E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	1.60E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.17E-10	1.24E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	2.29E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.67E-10	1.78E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	2.29E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.67E-11	1.78E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.07E-09**					**4.68E-05**
			Dermal	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	8.71E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	2.03E-09	(mg/kg-day)	6.00E-05	(mg/kg-day)	3.39E-05
				ARSENIC	4.69E-03	(mg/L)	1.62E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.42E-09	3.77E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.26E-04
				COPPER	2.35E-03	(mg/L)	8.09E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.89E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.72E-07
				MERCURY	3.90E-05	(mg/L)	1.34E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	3.13E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.13E-06
				SELENIUM	1.26E-02	(mg/L)	3.92E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	9.14E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.83E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.88E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.37E-07	1.46E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	1.17E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.55E-07	9.11E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	2.59E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.89E-06	2.01E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	1.70E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.24E-07	1.32E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.04E-06**					**1.81E-04**
		Exposure Point Total									**3.04E-06**					**2.28E-04**
		Finfish	Ingestion	**METALS**												
				ANTIMONY	6.09E-02	(mg/kg)	5.40E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.26E-05	(mg/kg-day)	4.00E-04	(mg/kg-day)	3.15E-02
				ARSENIC	5.62E-02	(mg/kg)	4.99E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.48E-07	1.16E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.88E-02
				COPPER	9.10E+00	(mg/kg)	8.07E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.88E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.71E-02
				MERCURY	4.60E-02	(mg/kg)	4.08E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	9.52E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.52E-02
				SELENIUM	1.00E+00	(mg/kg)	8.90E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.08E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.15E-02
				PCB CONGENERS												
				TOTAL PCB's	2.90E-01	(mg/kg)	2.57E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	5.15E-06	6.00E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.89E-06**					**2.54E-01**
		Exposure Point Total									**5.89E-06**					**2.54E-01**
	Exposure Medium Total										**8.93E-06**					**2.54E-01**
Surface Water Total											**8.93E-06**					**2.54E-01**
										Total of Receptor Risks Across All Media	**1.62E-05**				Total of Receptor Hazards Across All Media	**7.92E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	1.25E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.88E-08	2.92E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.92E-04
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	1.64E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.46E-07	3.83E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.28E-03
				CADMIUM	1.35E+00	(mg/kg)	6.89E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.61E-09	(mg/kg-day)	2.50E-05	(mg/kg-day)	6.43E-05
				COBALT	1.98E+01	(mg/kg)	1.01E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.36E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.86E-04
				COPPER	9.16E+01	(mg/kg)	4.67E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.09E-06	(mg/kg-day)	4.00E-02	(mg/kg-day)	2.73E-05
				MERCURY	2.27E-01	(mg/kg)	1.16E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	2.70E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.70E-05
				SELENIUM	2.40E+00	(mg/kg)	1.22E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.86E-08	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.71E-06
				ZINC	3.76E+02	(mg/kg)	1.92E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	4.48E-06	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.49E-05
				PAHS												
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	7.30E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.33E-07	1.70E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	3.80E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	7.60E-09	8.87E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.05E-07**					**2.49E-03**
		Exposure Point Total									**8.05E-07**					**2.49E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	4.57E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	5.95E-06	1.07E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.07E-01
				METALS												
				ARSENIC	1.26E-01	(mg/kg)	9.48E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.42E-05	2.21E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.37E-02
				CADMIUM	1.85E-01	(mg/kg)	1.39E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.25E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	3.25E-02
				COBALT	1.23E-01	(mg/kg)	9.25E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.16E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.20E-02
				COPPER	1.44E+01	(mg/kg)	1.08E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.53E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	6.32E-02
				MERCURY	2.36E-02	(mg/kg)	1.78E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	4.14E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	4.14E-02
				SELENIUM	1.10E+00	(mg/kg)	8.28E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.93E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.86E-02
				ZINC	4.69E+01	(mg/kg)	3.53E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	8.23E-03	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.74E-02
				PCB CONGENERS												
				TOTAL PCB's	2.72E-01	(mg/kg)	2.05E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.09E-05	4.77E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**6.11E-05**					**4.56E-01**
		Exposure Point Total									**6.11E-05**					**4.56E-01**
	Exposure Medium Total										**6.19E-05**					**4.58E-01**
Sediment Total											**6.19E-05**					**4.58E-01**

TABLE 5.7.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Patapsco River	Dermal	**METALS**												
				ANTIMONY	2.53E-04	(mg/L)	1.29E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.01E-09	(mg/kg-day)	6.00E-05	(mg/kg-day)	5.02E-05
				ARSENIC	4.69E-03	(mg/L)	2.39E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.59E-08	5.58E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.86E-04
				COPPER	2.35E-03	(mg/L)	1.20E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.80E-08	(mg/kg-day)	4.00E-02	(mg/kg-day)	6.99E-07
				MERCURY	3.90E-05	(mg/L)	1.99E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	4.64E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	4.64E-06
				SELENIUM	1.26E-02	(mg/L)	5.81E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.35E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.71E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	9.27E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.77E-07	2.16E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	5.79E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.22E-06	1.35E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	1.28E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.34E-06	2.98E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	8.41E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.14E-07	1.96E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.50E-05**					**2.69E-04**
		Exposure Point Total									**1.50E-05**					**2.69E-04**
		Finfish	Ingestion	**METALS**												
				ANTIMONY	6.09E-02	(mg/kg)	4.58E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.07E-05	(mg/kg-day)	4.00E-04	(mg/kg-day)	2.67E-02
				ARSENIC	5.62E-02	(mg/kg)	4.23E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.34E-06	9.87E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.29E-02
				COPPER	9.10E+00	(mg/kg)	6.85E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.60E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.99E-02
				MERCURY	4.60E-02	(mg/kg)	3.46E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	8.07E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	8.07E-02
				SELENIUM	1.00E+00	(mg/kg)	7.55E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.52E-02
				PCB CONGENERS												
				TOTAL PCB's	2.90E-01	(mg/kg)	2.18E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.36E-05	5.09E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.00E-05**					**2.16E-01**
		Exposure Point Total									**5.00E-05**					**2.16E-01**
	Exposure Medium Total										**6.50E-05**					**2.16E-01**
Surface Water Total											**6.50E-05**					**2.16E-01**
										Total of Receptor Risks Across All Media	**1.27E-04**				Total of Receptor Hazards Across All Media	**6.74E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 5.7.9
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	9.80E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.5E-06
BENZO(B)FLUORANTHENE	9.84E-01	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.4E-06
BENZO(K)FLUORANTHENE	1.02E+00	7.00E-01	-1.74E-01	252.32	6.12	4.28E+00	6.12E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.6E-06
BENZO(A)PYRENE	7.59E-01	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	3.4E-06
CHRYSENE	1.09E+00	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.8E-06
DIBENZ(A,H)ANTHRACENE	1.22E+00	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	8.4E-06
INDENO(1,2,3-C,D)PYRENE	1.16E+00	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	5.2E-06
BENZENE	1.25E+01	1.50E-02	-1.83E+00	78.10	2.13	5.10E-02	5.79E-07	2.88E-01	3.35E-01	3.68E-01	6.91E-01	4.7E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).

(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.

-- = Not applicable

B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis

cm/hr = Centimeter per hour

cm^2/hr = Square centimeter per hour

DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario

D_{sc} = Effective diffusivity for chemical transfer through the skin

U.S. EPA = U.S. Environmental Protection Agency

EPC = Exposure point concentration (see Table 5.3.2)

g/mol = Gram per mole

hr = Hour

K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics

Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)

Log K_p = Log of the dermal permeability coefficient

ug/L = Microgram per liter

mg/cm^2-event = Milligram per square centimeter per event

MW = Molecular weight

τ_{event} = Lag time per event

t* = Time it takes to reach steady-state

TABLE 5.7.10
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
WATERMAN - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
COKE POINT OFFSHORE AREA

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	9.80E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.5E-06
BENZO(B)FLUORANTHENE	9.84E-01	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.4E-06
BENZO(K)FLUORANTHENE	1.02E+00	7.00E-01	-1.74E-01	252.32	6.12	4.28E+00	6.12E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.6E-06
BENZO(A)PYRENE	7.59E-01	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	3.4E-06
CHRYSENE	1.09E+00	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.8E-06
DIBENZ(A,H)ANTHRACENE	1.22E+00	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	8.4E-06
INDENO(1,2,3-C,D)PYRENE	1.16E+00	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	5.2E-06
BENZENE	1.25E+01	1.50E-02	-1.83E+00	78.10	2.13	5.10E-02	5.79E-07	2.88E-01	3.35E-01	3.68E-01	6.91E-01	4.7E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).

(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{event}t, b, c, t*, and DA.

-- = Not applicable

B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis

cm/hr = Centimeter per hour

cm^2/hr = Square centimeter per hour

DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario

D_{sc} = Effective diffusivity for chemical transfer through the skin

U.S. EPA = U.S. Environmental Protection Agency

EPC = Exposure point concentration (see Table 5.3.2)

g/mol = Gram per mole

hr = Hour

K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics

Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)

Log K_p = Log of the dermal permeability coefficient

ug/L = Microgram per liter

mg/cm^2-event = Milligram per square centimeter per event

MW = Molecular weight

τ_{event} = Lag time per event

t* = Time it takes to reach steady-state

TABLE 5.7.11
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	1.40E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	3.6E-07
BENZO(A)PYRENE	5.10E-02	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	2.3E-07
DIBENZ(A,H)ANTHRACENE	7.30E-02	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	5.0E-07
INDENO(1,2,3-C,D)PYRENE	7.30E-02	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	3.3E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).
(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.
-- = Not applicable
B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis
cm/hr = Centimeter per hour
cm^2/hr = Square centimeter per hour
DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario
D_{sc} = Effective diffusivity for chemical transfer through the skin
U.S. EPA = U.S. Environmental Protection Agency
EPC = Exposure point concentration (see Table 5.3.6)
g/mol = Gram per mole
hr = Hour
K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics
Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)
Log K_p = Log of the dermal permeability coefficient
ug/L = Microgram per liter
mg/cm^2-event = Milligram per square centimeter per event
MW = Molecular weight
τ_{event} = Lag time per event
t* = Time it takes to reach steady-state

TABLE 5.7.12
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
WATERMAN - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT
PATAPSCO RIVER BACKGROUND

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	1.40E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	3.6E-07
BENZO(A)PYRENE	5.10E-02	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	2.3E-07
DIBENZ(A,H)ANTHRACENE	7.30E-02	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	5.0E-07
INDENO(1,2,3-C,D)PYRENE	7.30E-02	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	3.3E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).
(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{event}t, b, c, t*, and DA.
-- = Not applicable
B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis
cm/hr = Centimeter per hour
cm^2/hr = Square centimeter per hour
DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario
D_{sc} = Effective diffusivity for chemical transfer through the skin
U.S. EPA = U.S. Environmental Protection Agency
EPC = Exposure point concentration (see Table 5.3.6)
g/mol = Gram per mole
hr = Hour
K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics
Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)
Log K_p = Log of the dermal permeability coefficient
ug/L = Microgram per liter
mg/cm^2-event = Milligram per square centimeter per event
MW = Molecular weight
τ_{event} = Lag time per event
t* = Time it takes to reach steady-state

TABLE 5.9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	8.8E-09	1.6E-08	--	2.5E-08	ARSENIC	Skin	4.6E-05	8.2E-05	--	1.3E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.8E-06	3.2E-06	--	5.0E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	8.4E-06	1.4E-05	--	2.2E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.6E-10	2.2E-06	--	2.2E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	9.6E-10	3.9E-06	--	3.9E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	1.0E-10	4.1E-07	--	4.1E-07	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	7.4E-09	3.0E-05	--	3.0E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	1.1E-11	2.5E-08	--	2.5E-08	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.2E-08	7.4E-05	--	7.4E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.1E-09	4.6E-06	--	4.6E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	9.2E-10	3.1E-08	--	3.2E-08	BENZENE	Liver	9.8E-06	3.3E-04	--	3.4E-04
			(Total)	3.2E-08	1.1E-04	---	1.1E-04		(Total)	6.6E-05	4.3E-04	---	5.0E-04
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	4.1E-06	--	--	4.1E-06	ARSENIC	Skin	2.1E-02	--	--	2.1E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	8.0E-02	--	--	8.0E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	2.7E-02	--	--	2.7E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.5E-05	--	--	2.5E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	5.0E-07	--	--	5.0E-07	BENZENE	Liver	5.3E-03	--	--	5.3E-03
			(Total for Finfish)	2.9E-05	---	---	2.9E-05		(Total for Finfish)	1.3E-01	---	---	1.3E-01
							Total Risk Across Surface Water	**1.4E-04**				**Total Hazard Index Across Surface Water**	**1.3E-01**

TABLE 5.9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	2.1E-09	--	2.1E-09	DIOXIN (TEQ)	Developmental	--	3.3E-05	--	3.3E-05
			METALS					**METALS**					
			ARSENIC	--	2.3E-08	--	2.3E-08	ARSENIC	Skin	--	1.2E-04	--	1.2E-04
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	5.0E-07	--	5.0E-07
			COBALT	--	--	--	NA	COBALT	Blood	--	4.1E-05	--	4.1E-05
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	1.8E-06	--	1.8E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	3.9E-07	--	3.9E-07
			ZINC	--	--	--	NA	ZINC	Blood	--	1.4E-06	--	1.4E-06
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	2.4E-08	--	2.4E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	2.2E-08	--	2.2E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	2.2E-07	--	2.2E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	4.2E-08	--	4.2E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.2E-08	--	1.2E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	5.9E-04	--	5.9E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.3E-09	--	1.3E-09	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	3.9E-14	--	3.9E-14	BENZENE	Liver	--	4.2E-10	--	4.2E-10
			(Total)	---	3.4E-07	---	3.4E-07		(Total)	---	7.9E-04	---	7.9E-04
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-05	--	--	4.9E-05	DIOXIN (TEQ)	Developmental	8.8E-01	--	--	8.8E-01
			METALS					**METALS**					
			ARSENIC	1.1E-05	--	--	1.1E-05	ARSENIC	Skin	5.9E-02	--	--	5.9E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.2E-02	--	--	2.2E-02
			COBALT	--	--	--	NA	COBALT	Blood	6.0E-02	--	--	6.0E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	3.9E-02	--	--	3.9E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	2.9E-02	--	--	2.9E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.2E-02	--	--	2.2E-02
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.2E-06	--	--	1.2E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.2E-06	--	--	2.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	1.2E-04	--	--	1.2E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.5E-05	--	--	2.5E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	2.7E-07	--	--	2.7E-07	BENZENE	Liver	2.8E-03	--	--	2.8E-03
			(Total for Crabs)	8.8E-05	---	---	8.8E-05		(Total for Crabs)	1.1E+00	---	---	1.1E+00
							Total Risk Across Sediment	**8.9E-05**					**Total Hazard Index Across Sediment**	**1.1E+00**
							Total Risk Across All Media and All Exposure Routes	**2.3E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.2E+00**

TABLE 5.9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	2.3E-09	6.1E-09	--	8.4E-09	ARSENIC	Skin	3.6E-05	9.5E-05	--	1.3E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.4E-06	3.7E-06	--	5.1E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.6E-06	1.6E-05	--	2.2E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	7.5E-10	2.6E-06	--	2.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	7.5E-10	4.5E-06	--	4.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	7.8E-11	4.7E-07	--	4.7E-07	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.8E-09	3.4E-05	--	3.4E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	8.3E-12	2.9E-08	--	2.9E-08	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	9.3E-09	8.5E-05	--	8.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	8.8E-10	5.3E-06	--	5.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	2.4E-10	1.2E-08	--	1.2E-08	BENZENE	Liver	7.6E-06	3.8E-04	--	3.9E-04
			(Total)	2.0E-08	1.3E-04	---	1.3E-04		(Total)	5.1E-05	5.0E-04	---	5.5E-04
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.6E-06	--	--	1.6E-06	ARSENIC	Skin	2.4E-02	--	--	2.4E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.2E-02	--	--	9.2E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.1E-02	--	--	3.1E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	9.5E-06	--	--	9.5E-06	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.9E-07	--	--	1.9E-07	BENZENE	Liver	6.1E-03	--	--	6.1E-03
			(Total for Finfish)	1.1E-05	---	---	1.1E-05		(Total for Finfish)	1.5E-01	---	---	1.5E-01
							Total Risk Across Surface Water	**1.4E-04**					**Total Hazard Index Across Surface Water**	**1.5E-01**

TABLE 5.9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	3.1E-09	--	3.1E-09	DIOXIN (TEQ)	Developmental	--	1.5E-04	--	1.5E-04
			METALS					**METALS**					
			ARSENIC	--	3.3E-08	--	3.3E-08	ARSENIC	Skin	--	5.2E-04	--	5.2E-04
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	2.2E-06	--	2.2E-06
			COBALT	--	--	--	NA	COBALT	Blood	--	1.8E-04	--	1.8E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	8.1E-06	--	8.1E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	1.7E-06	--	1.7E-06
			ZINC	--	--	--	NA	ZINC	Blood	--	6.3E-06	--	6.3E-06
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	1.0E-07	--	1.0E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	9.7E-08	--	9.7E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	9.6E-07	--	9.6E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.9E-07	--	1.9E-07	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	5.3E-08	--	5.3E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	2.6E-03	--	2.6E-03
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	2.0E-09	--	2.0E-09	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	5.9E-14	--	5.9E-14	BENZENE	Liver	--	1.9E-09	--	1.9E-09
			(Total)	---	1.4E-06	---	1.4E-06		(Total)	---	3.5E-03	---	3.5E-03
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	1.0E+00	--	--	1.0E+00
			METALS					**METALS**					
			ARSENIC	4.3E-06	--	--	4.3E-06	ARSENIC	Skin	6.7E-02	--	--	6.7E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.5E-02	--	--	2.5E-02
			COBALT	--	--	--	NA	COBALT	Blood	7.0E-02	--	--	7.0E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	4.4E-02	--	--	4.4E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.3E-02	--	--	3.3E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.5E-02	--	--	2.5E-02
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.4E-06	--	--	1.4E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.5E-06	--	--	2.5E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	1.3E-04	--	--	1.3E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	9.4E-06	--	--	9.4E-06	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.0E-07	--	--	1.0E-07	BENZENE	Liver	3.3E-03	--	--	3.3E-03
			(Total for Crabs)	3.7E-05	---	---	3.7E-05		(Total for Crabs)	1.3E+00	---	---	1.3E+00
						Total Risk Across Sediment	**3.8E-05**					**Total Hazard Index Across Sediment**	**1.3E+00**
						Total Risk Across All Media and All Exposure Routes	**1.8E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.4E+00**

TABLE 5.9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.7E-09	2.3E-09	--	4.0E-09	ARSENIC	Skin	8.9E-05	1.2E-04	--	2.1E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	3.5E-06	4.6E-06	--	8.1E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.6E-05	2.0E-05	--	3.6E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	5.6E-10	9.6E-07	--	9.6E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	5.6E-10	1.7E-06	--	1.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.8E-11	1.7E-07	--	1.7E-07	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.3E-09	1.3E-05	--	1.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	6.2E-12	1.1E-08	--	1.1E-08	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	7.0E-09	3.2E-05	--	3.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	6.6E-10	2.0E-06	--	2.0E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.8E-10	4.4E-09	--	4.6E-09	BENZENE	Liver	1.9E-05	4.7E-04	--	4.9E-04
			(Total)	1.5E-08	4.9E-05	---	4.9E-05		(Total)	1.3E-04	6.1E-04	---	7.4E-04
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	5.9E-07	--	--	5.9E-07	ARSENIC	Skin	3.1E-02	--	--	3.1E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.1E-01	--	--	1.1E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.8E-02	--	--	3.8E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.5E-06	--	--	3.5E-06	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	7.2E-08	--	--	7.2E-08	BENZENE	Liver	7.6E-03	--	--	7.6E-03
			(Total for Finfish)	4.2E-06	---	---	4.2E-06		(Total for Finfish)	1.9E-01	---	---	1.9E-01
							Total Risk Across Surface Water	**5.3E-05**				**Total Hazard Index Across Surface Water**	**1.9E-01**

TABLE 5.9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.6E-09	--	1.6E-09	DIOXIN (TEQ)	Developmental	--	2.5E-04	--	2.5E-04
			METALS					**METALS**					
			ARSENIC	--	1.7E-08	--	1.7E-08	ARSENIC	Skin	--	8.8E-04	--	8.8E-04
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	3.8E-06	--	3.8E-06
			COBALT	--	--	--	NA	COBALT	Blood	--	3.1E-04	--	3.1E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	1.4E-05	--	1.4E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	2.9E-06	--	2.9E-06
			ZINC	--	--	--	NA	ZINC	Blood	--	1.1E-05	--	1.1E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	5.3E-08	--	5.3E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	4.9E-08	--	4.9E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	4.9E-07	--	4.9E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.6E-08	--	9.6E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	2.7E-08	--	2.7E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	4.5E-03	--	4.5E-03
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.0E-09	--	1.0E-09	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	3.0E-14	--	3.0E-14	BENZENE	Liver	--	3.2E-09	--	3.2E-09
			(Total)	---	7.3E-07	---	7.3E-07		(Total)	---	5.9E-03	---	5.9E-03
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-06	--	--	7.0E-06	DIOXIN (TEQ)	Developmental	1.3E+00	--	--	1.3E+00
			METALS					**METALS**					
			ARSENIC	1.6E-06	--	--	1.6E-06	ARSENIC	Skin	8.4E-02	--	--	8.4E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	3.1E-02	--	--	3.1E-02
			COBALT	--	--	--	NA	COBALT	Blood	8.7E-02	--	--	8.7E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	5.5E-02	--	--	5.5E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.1E-02	--	--	4.1E-02
			ZINC	--	--	--	NA	ZINC	Blood	3.2E-02	--	--	3.2E-02
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	5.4E-07	--	--	5.4E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	9.4E-07	--	--	9.4E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	1.7E-04	--	--	1.7E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.5E-06	--	--	3.5E-06	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	3.9E-08	--	--	3.9E-08	BENZENE	Liver	4.1E-03	--	--	4.1E-03
			(Total for Crabs)	1.4E-05	---	---	1.4E-05		(Total for Crabs)	1.6E+00	---	---	1.6E+00
						Total Risk Across Sediment	**1.4E-05**					**Total Hazard Index Across Sediment**	**1.6E+00**
						Total Risk Across All Media and All Exposure Routes	**6.8E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.8E+00**

TABLE 5.9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	--	3.4E-08	--	3.4E-08	ARSENIC	Skin	--	1.7E-04	--	1.7E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	6.8E-06	--	6.8E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	2.9E-05	--	2.9E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	4.7E-06	--	4.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	8.3E-06	--	8.3E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	8.6E-07	--	8.6E-07	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.3E-05	--	6.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	5.2E-08	--	5.2E-08	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.6E-04	--	1.6E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	9.7E-06	--	9.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	6.6E-08	--	6.6E-08	BENZENE	Liver	--	7.0E-04	--	7.0E-04
			(Total)	---	2.4E-04	---	2.4E-04		(Total)	---	9.1E-04	---	9.1E-04
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	5.0E-06	--	--	5.0E-06	ARSENIC	Skin	2.6E-02	--	--	2.6E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.7E-02	--	--	9.7E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.2E-02	--	--	3.2E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.0E-05	--	--	3.0E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	6.1E-07	--	--	6.1E-07	BENZENE	Liver	6.5E-03	--	--	6.5E-03
			(Total for Finfish)	3.6E-05	---	---	3.6E-05		(Total for Finfish)	1.6E-01	---	---	1.6E-01
						Total Risk Across Surface Water	**2.8E-04**					**Total Hazard Index Across Surface Water**	**1.6E-01**

TABLE 5.9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	5.9E-08	--	5.9E-08	DIOXIN (TEQ)	Developmental	--	9.3E-04	--	9.3E-04
			METALS					**METALS**					
			ARSENIC	--	6.3E-07	--	6.3E-07	ARSENIC	Skin	--	3.3E-03	--	3.3E-03
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	1.4E-05	--	1.4E-05
			COBALT	--	--	--	NA	COBALT	Blood	--	1.2E-03	--	1.2E-03
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	5.1E-05	--	5.1E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	1.1E-05	--	1.1E-05
			ZINC	--	--	--	NA	ZINC	Blood	--	4.0E-05	--	4.0E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	6.6E-07	--	6.6E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	6.1E-07	--	6.1E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.1E-06	--	6.1E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.2E-06	--	1.2E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	3.4E-07	--	3.4E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	1.7E-02	--	1.7E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	3.8E-08	--	3.8E-08	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	1.1E-12	--	1.1E-12	BENZENE	Liver	--	1.2E-08	--	1.2E-08
			(Total)	---	9.6E-06	---	9.6E-06		(Total)	---	2.2E-02	---	2.2E-02
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	6.0E-05	--	--	6.0E-05	DIOXIN (TEQ)	Developmental	1.1E+00	--	--	1.1E+00
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	7.1E-02	--	--	7.1E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.7E-02	--	--	2.7E-02
			COBALT	--	--	--	NA	COBALT	Blood	7.4E-02	--	--	7.4E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	4.7E-02	--	--	4.7E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.5E-02	--	--	3.5E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.7E-02	--	--	2.7E-02
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.5E-06	--	--	1.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.7E-06	--	--	2.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	1.4E-04	--	--	1.4E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.0E-05	--	--	3.0E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	3.3E-07	--	--	3.3E-07	BENZENE	Liver	3.5E-03	--	--	3.5E-03
			(Total for Crabs)	1.1E-04	---	---	1.1E-04		(Total for Crabs)	1.4E+00	---	---	1.4E+00
						Total Risk Across Sediment	**1.2E-04**					**Total Hazard Index Across Sediment**	**1.4E+00**
						Total Risk Across All Media and All Exposure Routes	**4.0E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.5E+00**

TABLE 5.9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	2.0E-06	2.4E-05	--	2.6E-05
			ARSENIC	9.4E-09	1.7E-08	--	2.6E-08	ARSENIC	Skin	4.9E-05	8.8E-05	--	1.4E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	1.8E-07	3.3E-07	--	5.2E-07
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-06	2.2E-06	--	3.4E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	7.9E-06	1.3E-05	--	2.1E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.4E-10	3.2E-07	--	3.2E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	6.0E-08	--	6.0E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.0E-10	2.0E-06	--	2.0E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	7.2E-10	4.4E-06	--	4.4E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	7.2E-11	2.9E-07	--	2.9E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	1.1E-08	7.1E-06	---	7.1E-06		(Total)	6.0E-05	1.3E-04	---	1.9E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	2.2E-02	--	--	2.2E-02
			ARSENIC	5.2E-06	--	--	5.2E-06	ARSENIC	Skin	2.7E-02	--	--	2.7E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	3.3E-02	--	--	3.3E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	6.6E-02	--	--	6.6E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	2.9E-02	--	--	2.9E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.6E-05	--	--	3.6E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	4.1E-05	---	---	4.1E-05		(Total for Finfish)	1.8E-01	---	---	1.8E-01
							Total Risk Across Surface Water						**Total Hazard Index Across Surface Water**
							4.8E-05						**1.8E-01**

TABLE 5.9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	6.7E-10	--	6.7E-10	DIOXIN (TEQ)	Developmental	--	1.0E-05	--	1.0E-05
			METALS					**METALS**					
			ARSENIC	--	8.8E-09	--	8.8E-09	ARSENIC	Skin	--	4.5E-05	--	4.5E-05
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	2.3E-06	--	2.3E-06
			COBALT	--	--	--	NA	COBALT	Blood	--	2.8E-05	--	2.8E-05
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	9.7E-07	--	9.7E-07
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	9.6E-07	--	9.6E-07
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	2.0E-07	--	2.0E-07
			ZINC	--	--	--	NA	ZINC	Blood	--	5.3E-07	--	5.3E-07
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	1.9E-08	--	1.9E-08	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	2.7E-10	--	2.7E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	2.9E-08	---	2.9E-08		(Total)	---	8.9E-05	---	8.9E-05
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-06	--	--	4.9E-06	DIOXIN (TEQ)	Developmental	8.8E-02	--	--	8.8E-02
			METALS					**METALS**					
			ARSENIC	1.2E-05	--	--	1.2E-05	ARSENIC	Skin	6.0E-02	--	--	6.0E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.7E-02	--	--	2.7E-02
			COBALT	--	--	--	NA	COBALT	Blood	5.9E-02	--	--	5.9E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	5.2E-02	--	--	5.2E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	3.4E-02	--	--	3.4E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.2E-02	--	--	3.2E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.3E-02	--	--	2.3E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.4E-05	--	--	3.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	5.0E-05	---	---	5.0E-05		(Total for Crabs)	3.7E-01	---	---	3.7E-01
							Total Risk Across Sediment	**5.0E-05**					**Total Hazard Index Across Sediment**	**3.7E-01**
							Total Risk Across All Media and All Exposure Routes	**9.8E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**5.5E-01**

TABLE 5.9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	1.5E-06	2.7E-05	--	2.9E-05
			ARSENIC	2.4E-09	6.5E-09	--	9.0E-09	ARSENIC	Skin	3.8E-05	1.0E-04	--	1.4E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	1.4E-07	3.8E-07	--	5.3E-07
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.5E-07	2.5E-06	--	3.5E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.1E-06	1.5E-05	--	2.1E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-10	3.7E-07	--	3.7E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	6.9E-08	--	6.9E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.9E-10	2.3E-06	--	2.3E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	5.6E-10	5.1E-06	--	5.1E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	5.6E-11	3.4E-07	--	3.4E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	3.6E-09	8.2E-06	---	8.2E-06		(Total)	4.7E-05	1.5E-04	---	1.9E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	2.5E-02	--	--	2.5E-02
			ARSENIC	2.0E-06	--	--	2.0E-06	ARSENIC	Skin	3.1E-02	--	--	3.1E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	3.8E-02	--	--	3.8E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	7.6E-02	--	--	7.6E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.3E-02	--	--	3.3E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.4E-05	--	--	1.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	1.6E-05	---	---	1.6E-05		(Total for Finfish)	2.0E-01	---	---	2.0E-01
							Total Risk Across Surface Water	**2.4E-05**				**Total Hazard Index Across Surface Water**	**2.0E-01**

TABLE 5.9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	9.9E-10	--	9.9E-10	DIOXIN (TEQ)	Developmental	--	4.6E-05	--	4.6E-05
			METALS					**METALS**					
			ARSENIC	--	1.3E-08	--	1.3E-08	ARSENIC	Skin	--	2.0E-04	--	2.0E-04
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	1.0E-05	--	1.0E-05
			COBALT	--	--	--	NA	COBALT	Blood	--	1.2E-04	--	1.2E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	4.3E-06	--	4.3E-06
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	4.3E-06	--	4.3E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	9.0E-07	--	9.0E-07
			ZINC	--	--	--	NA	ZINC	Blood	--	2.4E-06	--	2.4E-06
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	8.4E-08	--	8.4E-08	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	4.0E-10	--	4.0E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	9.9E-08	---	9.9E-08		(Total)	---	3.9E-04	---	3.9E-04
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-06	--	--	1.9E-06	DIOXIN (TEQ)	Developmental	1.0E-01	--	--	1.0E-01
			METALS					**METALS**					
			ARSENIC	4.5E-06	--	--	4.5E-06	ARSENIC	Skin	7.0E-02	--	--	7.0E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	3.1E-02	--	--	3.1E-02
			COBALT	--	--	--	NA	COBALT	Blood	6.8E-02	--	--	6.8E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	6.0E-02	--	--	6.0E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	3.9E-02	--	--	3.9E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.6E-02	--	--	3.6E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.6E-02	--	--	2.6E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.3E-05	--	--	1.3E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.9E-05	---	---	1.9E-05		(Total for Crabs)	4.3E-01	---	---	4.3E-01
							Total Risk Across Sediment	**1.9E-05**					**Total Hazard Index Across Sediment**	**4.3E-01**
							Total Risk Across All Media and All Exposure Routes	**4.3E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**6.3E-01**

TABLE 5.9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	1.5E-06	3.4E-05	--	3.5E-05
			ARSENIC	7.3E-10	2.4E-09	--	3.2E-09	ARSENIC	Skin	3.8E-05	1.3E-04	--	1.6E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	1.4E-07	4.7E-07	--	6.2E-07
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.5E-07	3.1E-06	--	4.1E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.1E-06	1.8E-05	--	2.4E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.2E-11	1.4E-07	--	1.4E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	2.6E-08	--	2.6E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.2E-10	8.6E-07	--	8.6E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.7E-10	1.9E-06	--	1.9E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.7E-11	1.2E-07	--	1.2E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	1.1E-09	3.0E-06	---	3.0E-06		(Total)	4.7E-05	1.8E-04	---	2.3E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	3.2E-02	--	--	3.2E-02
			ARSENIC	7.5E-07	--	--	7.5E-07	ARSENIC	Skin	3.9E-02	--	--	3.9E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	4.7E-02	--	--	4.7E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.5E-02	--	--	9.5E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.2E-02	--	--	4.2E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	5.1E-06	--	--	5.1E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	5.9E-06	---	---	5.9E-06		(Total for Finfish)	2.5E-01	---	---	2.5E-01
							Total Risk Across Surface Water	**8.9E-06**				**Total Hazard Index Across Surface Water**	**2.5E-01**

TABLE 5.9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	5.0E-10	--	5.0E-10	DIOXIN (TEQ)	Developmental	--	7.8E-05	--	7.8E-05
			METALS					**METALS**					
			ARSENIC	--	6.6E-09	--	6.6E-09	ARSENIC	Skin	--	3.4E-04	--	3.4E-04
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	1.7E-05	--	1.7E-05
			COBALT	--	--	--	NA	COBALT	Blood	--	2.1E-04	--	2.1E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	7.3E-06	--	7.3E-06
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	7.2E-06	--	7.2E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	1.5E-06	--	1.5E-06
			ZINC	--	--	--	NA	ZINC	Blood	--	4.0E-06	--	4.0E-06
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	4.3E-08	--	4.3E-08	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	2.0E-10	--	2.0E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	5.0E-08	---	5.0E-08		(Total)	---	6.7E-04	---	6.7E-04
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-07	--	--	7.0E-07	DIOXIN (TEQ)	Developmental	1.3E-01	--	--	1.3E-01
			METALS					**METALS**					
			ARSENIC	1.7E-06	--	--	1.7E-06	ARSENIC	Skin	8.7E-02	--	--	8.7E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	3.8E-02	--	--	3.8E-02
			COBALT	--	--	--	NA	COBALT	Blood	8.5E-02	--	--	8.5E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	7.5E-02	--	--	7.5E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	4.9E-02	--	--	4.9E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.6E-02	--	--	4.6E-02
			ZINC	--	--	--	NA	ZINC	Blood	3.2E-02	--	--	3.2E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.8E-06	--	--	4.8E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	7.2E-06	---	---	7.2E-06		(Total for Crabs)	5.4E-01	---	---	5.4E-01
							Total Risk Across Sediment	**7.3E-06**					**Total Hazard Index Across Sediment**	**5.4E-01**
							Total Risk Across All Media and All Exposure Routes	**1.6E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**7.9E-01**

TABLE 5.9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background
Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	0.0E+00	5.0E-05	--	5.0E-05
			ARSENIC	--	3.6E-08	--	3.6E-08	ARSENIC	Skin	--	1.9E-04	--	1.9E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	7.0E-07	--	7.0E-07
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	4.6E-06	--	4.6E-06
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	2.7E-05	--	2.7E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	6.8E-07	--	6.8E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.3E-07	--	1.3E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	4.2E-06	--	4.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.3E-06	--	9.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	6.1E-07	--	6.1E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	1.5E-05	---	1.5E-05	(Total)		---	2.7E-04	---	2.7E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ANTIMONY	--	--	--	NA	ANTIMONY	Blood glucose and cholesterol	2.7E-02	--	--	2.7E-02
			ARSENIC	6.3E-06	--	--	6.3E-06	ARSENIC	Skin	3.3E-02	--	--	3.3E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	4.0E-02	--	--	4.0E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	8.1E-02	--	--	8.1E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.5E-02	--	--	3.5E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.4E-05	--	--	4.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	5.0E-05	---	---	5.0E-05	(Total for Finfish)		2.2E-01	---	---	2.2E-01
						Total Risk Across Surface Water	**6.5E-05**					**Total Hazard Index Across Surface Water**	**2.2E-01**

TABLE 5.9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.9E-08	--	1.9E-08	DIOXIN (TEQ)	Developmental	--	2.9E-04	--	2.9E-04
			METALS					**METALS**					
			ARSENIC	--	2.5E-07	--	2.5E-07	ARSENIC	Skin	--	1.3E-03	--	1.3E-03
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	--	6.4E-05	--	6.4E-05
			COBALT	--	--	--	NA	COBALT	Blood	--	7.9E-04	--	7.9E-04
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	--	2.7E-05	--	2.7E-05
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	2.7E-05	--	2.7E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	5.7E-06	--	5.7E-06
			ZINC	--	--	--	NA	ZINC	Blood	--	1.5E-05	--	1.5E-05
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	5.3E-07	--	5.3E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	7.6E-09	--	7.6E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	8.0E-07	---	8.0E-07		(Total)	---	2.5E-03	---	2.5E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	5.9E-06	--	--	5.9E-06	DIOXIN (TEQ)	Developmental	1.1E-01	--	--	1.1E-01
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	7.4E-02	--	--	7.4E-02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	3.2E-02	--	--	3.2E-02
			COBALT	--	--	--	NA	COBALT	Blood	7.2E-02	--	--	7.2E-02
			COPPER	--	--	--	NA	COPPER	Gastrointestinal System	6.3E-02	--	--	6.3E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	4.1E-02	--	--	4.1E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.9E-02	--	--	3.9E-02
			ZINC	--	--	--	NA	ZINC	Blood	2.7E-02	--	--	2.7E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.1E-05	--	--	4.1E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	6.1E-05	---	---	6.1E-05		(Total for Crabs)	4.6E-01	---	---	4.6E-01
							Total Risk Across Sediment	**6.2E-05**					**Total Hazard Index Across Sediment**	**4.6E-01**
							Total Risk Across All Media and All Exposure Routes	**1.3E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**6.7E-01**

TABLE 5.10.1

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	2.2E-06	--	2.2E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	3.9E-06	--	3.9E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	3.0E-05	--	3.0E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	7.4E-05	--	7.4E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	4.6E-06	--	4.6E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	1.1E-04	---	1.1E-04	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	4.1E-06	--	--	4.1E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.5E-05	--	--	2.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	2.9E-05	---	---	2.9E-05	(Total for Finfish)		---	---	---	---
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-05	--	--	4.9E-05	DIOXIN (TEQ)	Developmental	8.8E-01	--	--	8.8E-01
			METALS					**METALS**					
			ARSENIC	1.1E-05	--	--	1.1E-05	ARSENIC	Skin	--	--	--	NA
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.2E-06	--	--	1.2E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.2E-06	--	--	2.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.5E-05	--	--	2.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	8.8E-05	---	---	8.8E-05	(Total for Crabs)		8.8E-01	---	---	8.8E-01
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **8.8E-01**

1) Total Carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute signficiantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.1.

TABLE 5.10.2

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	2.6E-06	--	2.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	4.5E-06	--	4.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	3.4E-05	--	3.4E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	8.5E-05	--	8.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	5.3E-06	--	5.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	1.3E-04	---	1.3E-04	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.6E-06	--	--	1.6E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	9.5E-06	--	--	9.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	1.1E-05	---	---	1.1E-05	(Total for Finfish)		---	---	---	---
						Total Risk Across Surface Water[1]	**NA**					**Total Hazard Index Across Surface Water[1]**	**NA**
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	1.0E+00	--	--	1.0E+00
			METALS					**METALS**					
			ARSENIC	4.3E-06	--	--	4.3E-06	ARSENIC	Skin	--	--	--	NA
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.4E-06	--	--	1.4E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.5E-06	--	--	2.5E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	9.4E-06	--	--	9.4E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	3.6E-05	---	---	3.6E-05	(Total for Crabs)		1.0E+00	---	---	1.0E+00
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **1.0E+00**

1) Total Carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute signficiantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.2.

TABLE 5.10.3

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(B)FLUORANTHENE	--	1.7E-06	--	1.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.3E-05	--	1.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.2E-05	--	3.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	2.0E-06	--	2.0E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	4.8E-05	---	4.8E-05	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.1E-01	--	--	1.1E-01
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.5E-06	--	--	3.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	3.5E-06	---	---	---	(Total for Finfish)		1.1E-01	---	---	1.1E-01
							Total Risk Across Surface Water[1]	**NA**				**Total Hazard Index Across Surface Water[1]**	**NA**
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-06	--	--	7.0E-06	DIOXIN (TEQ)	Developmental	1.3E+00	--	--	1.3E+00
			METALS					**METALS**					
			ARSENIC	1.6E-06	--	--	1.6E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.5E-06	--	--	3.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.2E-05	---	---	1.2E-05	(Total for Crabs)		1.3E+00	---	---	1.3E+00
							Total Risk Across Sediment[1]	**NA**				**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Central Nervous System	**1.1E-01**
Total Hazard Index Across For Developmental System	**1.3E+00**

1) Total Carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute signficiantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.3.

TABLE 5.10.4

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	4.7E-06	--	4.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	8.3E-06	--	8.3E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.3E-05	--	6.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.6E-04	--	1.6E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	9.7E-06	--	9.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	2.4E-04	---	2.4E-04		(Total)	---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	5.0E-06	--	--	5.0E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.0E-05	--	--	3.0E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	3.5E-05	---	---	3.5E-05		(Total for Finfish)	---	---	---	---
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**
Sediment	Sediment	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	6.1E-06	--	6.1E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.2E-06	--	1.2E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	7.3E-06	---	7.3E-06		(Total)	---	---	---	---
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	6.0E-05	--	--	6.0E-05	DIOXIN (TEQ)	Developmental	1.1E+00	--	--	1.1E+00
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	--	--	--	NA
			PAHS					**PAHS**					
			BENZO(B)FLUORANTHENE	1.5E-06	--	--	1.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.7E-06	--	--	2.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.0E-05	--	--	3.0E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.1E-04	---	---	1.1E-04		(Total for Crabs)	1.1E+00	---	---	1.1E+00
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **1.1E+00**

1) Total Carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute signficiantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.4.

TABLE 5.10.5

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	2.0E-06	--	2.0E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	4.4E-06	--	4.4E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	6.4E-06	---	6.4E-06	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	5.2E-06	--	--	5.2E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.6E-05	--	--	3.6E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	4.1E-05	---	---	4.1E-05	(Total for Finfish)		---	---	---	---
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-06	--	--	4.9E-06	DIOXIN (TEQ)	Developmental	--	--	--	NA
			METALS					**METALS**		--			
			ARSENIC	1.2E-05	--	--	1.2E-05	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**		--			
			TOTAL PCB's	3.4E-05	--	--	3.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	5.0E-05	---	---	5.0E-05	(Total for Crabs)		---	---	---	---
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

1) Total carcinogenic risks and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.5.

TABLE 5.10.6

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	2.3E-06	--	2.3E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	5.1E-06	--	5.1E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	7.4E-06	---	7.4E-06	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	2.0E-06	--	--	2.0E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.4E-05	--	--	1.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	1.6E-05	---	---	1.6E-05	(Total for Finfish)		---	---	---	---
						Total Risk Across Surface Water[1]	**NA**					**Total Hazard Index Across Surface Water**[1]	**NA**
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-06	--	--	1.9E-06	DIOXIN (TEQ)	Developmental	1.0E-01	--	--	1.0E-01
			METALS					**METALS**					
			ARSENIC	4.5E-06	--	--	4.5E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.3E-05	--	--	1.3E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.9E-05	---	---	1.9E-05	(Total for Crabs)		1.0E-01	---	---	1.0E-01
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment**[1]	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **1.0E-01**

1) Total carcinogenic risks and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.6.

TABLE 5.10.7

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			DIBENZ(A,H)ANTHRACENE	--	1.9E-06	--	1.9E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	1.9E-06	---	1.9E-06		(Total)	---	---	---	---
	Finfish	Patapsco River	**PCB CONGENERS**					**PCB CONGENERS**					
			TOTAL PCB's	5.1E-06	--	--	5.1E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	5.1E-06	---	---	5.1E-06		(Total for Finfish)	---	---	---	---
							Total Risk Across Surface Water[1]	**NA**				**Total Hazard Index Across Surface Water[1]**	**NA**
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	--	--	NA	DIOXIN (TEQ)	Developmental	1.3E-01	--	--	1.3E-01
			METALS					**METALS**					
			ARSENIC	1.7E-06	--	--	1.7E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.8E-06	--	--	4.8E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	6.5E-06	---	---	6.5E-06		(Total for Crabs)	1.3E-01	---	---	1.3E-01
							Total Risk Across Sediment[1]	**NA**				**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **1.3E-01**

1) Total carcinogenic risks and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.7.

TABLE 5.10.8

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR PUBLIC HEALTH IMPACT

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	4.2E-06	--	4.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.3E-06	--	9.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	1.4E-05	---	1.4E-05	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	6.3E-06	--	--	6.3E-06	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.4E-05	--	--	4.4E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Finfish)	5.0E-05	---	---	5.0E-05	(Total for Finfish)		---	---	---	---
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**
Sediment	Sediment	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	--	--	NA	BENZO(A)PYRENE	NA	--	--	--	NA
			(Total)	---	---	---	---		(Total)	---	---	---	---
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	5.9E-06	--	--	5.9E-06	DIOXIN (TEQ)	Developmental	1.1E-01	--	--	1.1E-01
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.1E-05	--	--	4.1E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	6.1E-05	---	---	6.1E-05	(Total for Crabs)		1.1E-01	---	---	1.1E-01
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Developmental System **1.1E-01**

1) Total carcinogenic risks and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 5.9.8.

TABLE 6.2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for(5) Contaminant Deletion or Selection
BUTYLTINS															
688-73-3	TRIBUTYLTIN	1.90E-02	J	1.90E-02	J	mg/kg	S-B1	1/13	2.50E-03 - 8.90E-03	1.90E-02	NA	1.18E+02	N	No	BSL
DIOXINS															
WHOTEQNDDL	WHO TEQ (ND=DL)	3.70E-06		7.77E-05		mg/kg	BH-SED-10-00_10	27/27	1.60E-05 - 1.60E-05	7.77E-05	NA	5.03E-04		No	BSL
METALS															
7429-90-5	ALUMINUM	8.92E+03	J	2.51E+04		mg/kg	BH-SED-03F-00_10	19/19	2.80E+00 - 3.21E+01	2.51E+04	NA	NA		No	NSL
7440-36-0	ANTIMONY	2.80E-01	L	3.30E+00	J	mg/kg	BH-SED-03F-00_10	37/37	1.90E-01 - 2.80E+00	3.30E+00	NA	2.35E+02	N	No	BSL
7440-38-2	**ARSENIC**	**4.50E+00**		**7.20E+01**		**mg/kg**	**SP09-02**	**37/37**	**9.50E-02 - 1.60E+00**	**7.20E+01**	**NA**	**4.36E+01**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	5.00E-01		2.20E+00		mg/kg	SP09-02 / BH-SED-21-00_10 / BH-SED-20-00_10 / BH-SED-19-00_10	37/37	9.50E-02 - 8.00E-01	2.20E+00	NA	5.49E+01	N	No	BSL
7440-43-9	CADMIUM	3.60E-01		7.70E+00		mg/kg	SP09-02	37/37	9.50E-02 - 1.40E+00	7.70E+00	NA	9.80E+02	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	4.20E+01	K	5.04E+02		mg/kg	BH-SED-03F-00_10	37/37	1.90E-01 - 1.40E+00	5.04E+02	NA	7.64E+04	N	No	BSL
7440-48-4	COBALT	1.35E+01		5.30E+01		mg/kg	SP09-03	19/19	4.70E-02 - 8.00E+00	5.30E+01	NA	1.18E+03	N	No	BSL
7440-50-8	COPPER	2.74E+01		5.95E+02	L	mg/kg	BH-SED-03C-00_09	37/37	1.90E-01 - 4.00E+00	5.95E+02	NA	1.57E+05	N	No	BSL
57-12-5	CYANIDE	2.60E-01	B	8.40E+01		mg/kg	S-B1	16/19	9.40E-01 - 6.90E+00	8.40E+01	NA	7.84E+04	N	No	BSL
7439-89-6	IRON	2.87E+04		1.20E+05		mg/kg	SP09-03	19/19	4.70E+00 - 7.52E+01	1.20E+05	NA	NA		No	NSL
7439-92-1	LEAD	4.30E+01		1.28E+03		mg/kg	SP09-02	37/37	9.50E-02 - 8.30E-01	1.28E+03	NA	NA		No	NSL
7439-96-5	MANGANESE	6.75E+02		1.59E+03		mg/kg	BH-SED-19-00_10 / S-B1	19/19	4.70E-02 - 2.40E+00	1.59E+03	NA	8.06E+03	N	No	BSL
7439-97-6	MERCURY	1.30E-01		1.70E+00		mg/kg	BH-SED-10-00_09	37/37	3.10E-02 - 9.00E-02	1.70E+00	NA	8.23E+01	N	No	BSL
7440-02-0	NICKEL	1.77E+01		5.64E+01		mg/kg	BH-SED-10-00_09	37/37	9.50E-02 - 6.40E+00	5.64E+01	NA	6.72E+03	N	No	BSL
7782-49-2	SELENIUM	3.20E-01	J	1.23E+01	L	mg/kg	SP09-02	37/37	4.70E-01 - 1.40E+00	1.23E+01	NA	4.20E+04	N	No	BSL
7440-22-4	SILVER	1.20E-01		2.80E+00		mg/kg	BH-SED-03C-00_09 / SP09-02	37/37	9.50E-02 - 8.00E-01	2.80E+00	NA	1.68E+03	N	No	BSL
7440-28-0	THALLIUM	2.20E-01		9.80E-01		mg/kg	SP09-02	33/37	9.50E-02 - 1.60E+00	9.80E-01	NA	NA		No	NSL
7440-31-5	TIN	2.60E+00		2.00E+02		mg/kg	BH-SED-03F-00_10	19/19	4.70E-01 - 1.61E+01	2.00E+02	NA	NA		No	NSL
7440-62-2	VANADIUM	6.35E+01		1.70E+02		mg/kg	BH-SED-03F-00_10	9/9	1.30E-01 - 2.40E-01	1.70E+02	NA	4.20E+04	N	No	BSL
7440-66-6	ZINC	9.95E+01		2.73E+03		mg/kg	BH-SED-10-00_09	37/37	4.70E-01 - 6.70E+00	2.73E+03	NA	NA		No	NSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	1.50E-02	J	3.30E+00		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	3.30E+00	NA	5.20E+02	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	2.70E-02	J	6.50E+00		mg/kg	BH-SED-03B-00_09	37/37	3.20E-02 - 2.20E+00	6.50E+00	NA	1.21E+03	N	No	BSL
83-32-9	ACENAPHTHENE	4.20E-02	J	5.90E+00		mg/kg	BH-SED-03B-00_09	37/37	3.20E-02 - 2.20E+00	5.90E+00	NA	1.81E+04	N	No	BSL
208-96-8	ACENAPHTHYLENE	5.70E-02	J	4.10E+01		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	4.10E+01	NA	1.81E+04	C	No	BSL
120-12-7	ANTHRACENE	1.40E-01	J	2.10E+01		mg/kg	BH-SED-07-00_09	37/37	6.30E-02 - 1.10E+01	2.10E+01	NA	9.04E+04	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**2.80E-01**		**6.10E+01**		**mg/kg**	**BH-SED-07-00_09**	**37/37**	**3.20E-02 - 2.70E+00**	**6.10E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**3.20E-01**		**5.60E+01**		**mg/kg**	**BH-SED-07-00_09**	**37/37**	**3.20E-02 - 2.70E+00**	**5.60E+01**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**5.80E-01**		**5.30E+01**		**mg/kg**	**BH-SED-05-00_09**	**37/37**	**3.20E-02 - 2.20E+00**	**5.30E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	2.20E-01	J /	2.00E+01		mg/kg	BH-SED-06-00_09	37/37	3.20E-02 - 2.20E+00	2.00E+01	NA	9.04E+03	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	1.90E-01	J	1.80E+01		mg/kg	BH-SED-07-00_09	19/37	3.20E-02 - 2.20E+00	1.80E+01	NA	9.61E+01	C	No	BSL
218-01-9	CHRYSENE	2.80E-01		6.30E+01		mg/kg	BH-SED-07-00_09	37/37	3.20E-02 - 2.70E+00	6.30E+01	NA	9.61E+02	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**8.60E-02**	**J**	**6.30E+00**		**mg/kg**	**BH-SED-06-00_09**	**34/37**	**3.20E-02 - 2.20E+00**	**6.30E+00**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	5.30E-01		1.40E+02		mg/kg	BH-SED-07-00_09	37/37	3.20E-02 - 2.70E+00	1.40E+02	NA	1.21E+04	N	No	BSL
86-73-7	FLUORENE	6.30E-02		4.50E+00		mg/kg	SP09-02	37/37	3.20E-02 - 2.20E+00	4.50E+00	NA	1.21E+04	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**1.80E-01**	**J**	**2.50E+01**		**mg/kg**	**BH-SED-05-00_09**	**37/37**	**3.20E-02 - 2.20E+00**	**2.50E+01**	**NA**	**9.61E+00**	**C**	**Yes**	**ASL**
91-20-3	**NAPHTHALENE**	**4.60E-01**		**7.20E+03**		**mg/kg**	**BH-SED-03B-00_09**	**37/37**	**3.20E-02 - 1.10E+02**	**7.20E+03**	**NA**	**6.03E+03**	**C**	**Yes**	**ASL**
85-01-8	PHENANTHRENE	2.40E-01		2.00E+01		mg/kg	BH-SED-03B-00_09 / SP09-02	37/37	3.20E-02 - 2.20E+00	2.00E+01	NA	9.04E+03	N	No	BSL
129-00-0	PYRENE	3.50E-01		5.90E+01		mg/kg	BH-SED-05-00_09	37/37	3.20E-02 - 2.20E+00	5.90E+01	NA	9.04E+03	N	No	BSL

TABLE 6.2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for (5) Contaminant Deletion or Selection
PCB CONGENERS															
PCBs	**TOTAL PCBs (ND=DL)**	**1.17E-02**		**4.89E-01**		**mg/kg**	**S-B1**	**26/27**	**2.80E-03 - 2.80E-03**	**4.89E-01**	**NA**	**1.08E-03**		**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS															
71-43-2	BENZENE	4.00E-03	J	7.90E-02		mg/kg	BH-SED-13A-00_09	3/33	6.60E-03 - 2.90E-02	7.90E-02	NA	7.13E+04	C	No	BSL
100-41-4	ETHYLBENZENE	4.90E-03	J	4.90E-03	J	mg/kg	BH-SED-13A-00_09	1/33	6.60E-03 - 2.90E-02	4.90E-03	NA	5.94E+03	C	No	BSL
75-09-2	METHYLENE CHLORIDE	3.60E-03	J	3.60E-03	J	mg/kg	SP09-06	1/33	6.60E-03 - 2.90E-02	3.60E-03	NA	NA		No	NSL
108-88-3	TOLUENE	2.40E-03	J	5.70E-02		mg/kg	BH-SED-13A-00_09	2/33	6.60E-03 - 2.90E-02	5.70E-02	NA	NA		No	NSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
K = Reported value may be biased high.
L = Reported value may be biased low.

TABLE 6.2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for(5) Contaminant Deletion or Selection
METALS															
7429-90-5	ALUMINUM	2.26E+01	J	9.04E+01		µg/L	BH-W-20-D_10	51/51	3.00E+01 - 3.00E+01	9.04E+01	NA	1.24E+06	N	No	BSL
7440-36-0	ANTIMONY	1.30E-01	B	3.20E-01	J / J	µg/L	BH-W-10B-D_10 / BH-W-02-S_10	51/51	2.00E+00 - 2.00E+00	3.20E-01	NA	7.44E+01	N	No	BSL
7440-38-2	ARSENIC	2.60E+00		7.60E+00		µg/L	BH-W-19-D_10	51/51	1.00E+00 - 1.00E+00	7.60E+00	NA	1.93E+01	C	No	BSL
7440-41-7	BERYLLIUM	4.40E-02	J	4.70E-02	J	µg/L	BH-W-11-D_10	2/51	1.00E+00 - 1.00E+00	4.70E-02	NA	1.74E+01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	2.10E+00		4.90E+00		µg/L	BH-W-09B-M_10	51/51	2.00E+00 - 2.00E+00	4.90E+00	NA	2.42E+04	N	No	BSL
7440-48-4	COBALT	2.80E-01	J	5.20E-01		µg/L	BH-W-20-D_10	51/51	5.00E-01 - 5.00E-01	5.20E-01	NA	9.31E+02	N	No	BSL
7440-50-8	COPPER	1.80E+00	J / J / J	2.90E+00		µg/L	BH-W-03D-D_10 / BH-W-02-S_10	51/51	2.00E+00 - 2.00E+00	2.90E+00	NA	4.96E+04	N	No	BSL
7439-89-6	IRON	5.35E+01		2.12E+02		µg/L	BH-W-20-D_10	51/51	5.00E+01 - 5.00E+01	2.12E+02	NA	8.69E+05	N	No	BSL
7439-92-1	LEAD	2.30E-02	J / J	5.60E-01	J	µg/L	BH-W-11-D_10	51/51	1.00E+00 - 1.00E+00	5.60E-01	NA	1.50E+01		No	BSL
7439-96-5	MANGANESE	2.22E+01		1.98E+02		µg/L	BH-W-20-D_10	51/51	5.00E-01 - 5.00E-01	1.98E+02	NA	1.19E+03	N	No	BSL
7439-97-6	MERCURY	3.90E-02	J / J	6.30E-02	J	µg/L	BH-W-13B-S_10	5/51	2.00E-01 - 2.00E-01	6.30E-02	NA	2.61E+01	N	No	BSL
7440-02-0	NICKEL	4.80E+00		7.90E+00		µg/L	BH-W-03D-D_10	51/51	1.00E+00 - 1.00E+00	7.90E+00	NA	4.96E+03	N	No	BSL
7782-49-2	SELENIUM	6.40E+00		2.45E+01		µg/L	BH-W-19-D_10	51/51	5.00E+00 - 5.00E+00	2.45E+01	NA	6.20E+03	N	No	BSL
7440-28-0	THALLIUM	1.60E-02	B / B / J	1.30E-01	B / B	µg/L	BH-W-02-M_10 / BH-W-10-M_10	37/51	1.00E+00 - 1.00E+00	1.30E-01	NA	NA		No	NSL
7440-31-5	TIN	1.50E+00	J	3.20E+00	J	µg/L	BH-W-10-S_10	11/51	5.00E+00 - 5.00E+00	3.20E+00	NA	7.44E+05	N	No	BSL
7440-62-2	VANADIUM	1.00E-01	B	2.80E+00		µg/L	BH-W-13B-S_10	48/51	1.00E+00 - 1.00E+00	2.80E+00	NA	6.20E+03	N	No	BSL
7440-66-6	ZINC	3.70E+00	J	8.46E+01		µg/L	BH-W-03F-S_10	51/51	5.00E+00 - 5.00E+00	8.46E+01	NA	6.20E+05	N	No	BSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	1.60E-02	J / J	2.00E-01		µg/L	BH-W-13A-S_09	43/96	1.90E-01 - 1.90E-01	2.00E-01	NA	1.07E+01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	1.50E-02	J	3.50E-01		µg/L	BH-W-13A-S_09	63/96	1.90E-01 - 1.90E-01	3.50E-01	NA	5.41E+01	N	No	BSL
83-32-9	ACENAPHTHENE	2.40E-02	J / J	1.00E-01	J	µg/L	BH-W-05-S_09	21/96	1.90E-01 - 1.90E-01	1.00E-01	NA	8.66E+02	N	No	BSL
208-96-8	ACENAPHTHYLENE	1.10E-02	J	2.40E-01		µg/L	BH-W-13A-S_09	22/96	1.90E-01 - 1.90E-01	2.40E-01	NA	8.17E+02	C	No	BSL
120-12-7	ANTHRACENE	8.40E-03	J	1.80E+00		µg/L	BH-W-11-S_09	21/96	1.90E-01 - 1.90E-01	1.80E+00	NA	2.62E+03	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**5.80E-02**	**J**	**8.70E+00**		**µg/L**	**BH-W-03A-S_09**	**20/96**	**1.90E-01 - 1.90E-01**	**8.70E+00**	**NA**	**8.44E-02**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**3.40E-02**	**J**	**6.80E+00**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**6.80E+00**	**NA**	**5.67E-03**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**1.60E-02**	**J**	**8.00E+00**		**µg/L**	**BH-W-03A-S_09 / BH-W-11-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**8.00E+00**	**NA**	**5.67E-02**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	1.70E-02	J	9.60E+00		µg/L	BH-W-11-S_09	22/96	1.90E-01 - 1.90E-01	9.60E+00	NA	3.32E+01	N	No	BSL
207-08-9	**BENZO(K)FLUORANTHENE**	**2.10E-02**	**J**	**9.20E+00**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**9.20E+00**	**NA**	**5.74E-01**	**C**	**Yes**	**ASL**
218-01-9	**CHRYSENE**	**5.70E-02**	**J**	**9.60E+00**		**µg/L**	**BH-W-03A-S_09**	**20/96**	**1.90E-01 - 1.90E-01**	**9.60E+00**	**NA**	**6.65E+00**	**C**	**Yes**	**ASL**
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**5.70E-02**	**J**	**1.10E+01**		**µg/L**	**BH-W-03A-S_09**	**21/96**	**1.90E-01 - 1.90E-01**	**1.10E+01**	**NA**	**2.64E-03**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	1.00E-02	J / J	4.70E+00		µg/L	BH-W-11-S_09	50/96	1.90E-01 - 1.90E-01	4.70E+00	NA	2.26E+02	N	No	BSL
86-73-7	FLUORENE	1.90E-02	J	1.50E-01	J	µg/L	BH-W-11-S_09	40/96	1.90E-01 - 1.90E-01	1.50E-01	NA	4.51E+02	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**1.90E-02**	**J**	**9.90E+00**		**µg/L**	**BH-W-03A-S_09**	**23/96**	**1.90E-01 - 1.90E-01**	**9.90E+00**	**NA**	**3.97E-02**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	3.80E-02	J	6.70E+00		µg/L	BH-W-13A-S_09	92/96	1.90E-01 - 1.90E-01	6.70E+00	NA	5.28E+02	C	No	BSL
85-01-8	PHENANTHRENE	4.20E-02	J	1.20E+00		µg/L	BH-W-11-S_09	84/96	1.90E-01 - 1.90E-01	1.20E+00	NA	2.66E+02	N	No	BSL
129-00-0	PYRENE	1.10E-02	J	4.70E+00		µg/L	BH-W-11-S_09	29/96	1.90E-01 - 1.90E-01	4.70E+00	NA	1.85E+02	N	No	BSL
VOLATILE ORGANIC COMPOUNDS															
95-50-1	1,2-DICHLOROBENZENE	2.90E+00	J	2.90E+00	J	µg/L	BH-W-05-D_09	1/96	5.00E+00 - 5.00E+00	2.90E+00	NA	2.72E+03	N	No	BSL
71-43-2	**BENZENE**	**1.00E+00**	**J / J / J / J**	**7.20E+01**	**L**	**µg/L**	**BH-W-05-S_09**	**50/96**	**5.00E+00 - 5.00E+00**	**7.20E+01**	**NA**	**3.51E+01**	**C**	**Yes**	**ASL**
67-66-3	CHLOROFORM	1.00E+00	J	1.00E+00	J	µg/L	BH-W-02-S_09	1/96	5.00E+00 - 5.00E+00	1.00E+00	NA	1.37E+02	C	No	BSL
100-41-4	ETHYLBENZENE	7.40E-01	J	4.00E+01		µg/L	BH-W-09-D_09	9/96	5.00E+00 - 5.00E+00	4.00E+01	NA	5.37E+01	C	No	BSL
108-88-3	TOLUENE	8.50E-01	J	1.50E+01		µg/L	BH-W-05-D_09	59/84	5.00E+00 - 5.00E+00	1.50E+01	NA	3.20E+04	N	No	BSL
1330-20-7	XYLENES (TOTAL)	2.80E+00	J	6.50E+00	J	µg/L	BH-W-03B-S_10	14/42	1.50E+01 - 1.50E+01	6.50E+00	NA	4.68E+03	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes
Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
µg/L = micrograms per liter

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
L = Reported value may be biased low.

TABLE 6.2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
BUTYLTINS									
688-73-3	TRIBUTYLTIN	mg/kg	1.90E-02	1.21E+00	2.30E-02	4.06E-02	N	No	ASL
DIOXINS									
WHOTEQNDDL	**WHO TEQ (ND=DL)**	**mg/kg**	**2.59E-05**	**2.35E-01**	**6.09E-06**	**2.43E-08**	**C**	**Yes**	**ASL**
METALS									
7429-90-5	ALUMINUM	mg/kg	2.22E+04	4.00E-03	8.87E+01	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	mg/kg	1.42E+00	3.15E-02	4.47E-02	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**mg/kg**	**2.76E+01**	**5.41E-02**	**1.50E+00**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	mg/kg	1.66E+00	3.25E-03	5.40E-03	2.70E-01	N	No	BSL
7440-43-9	CADMIUM	mg/kg	2.97E+00	7.76E-03	2.30E-02	1.35E-01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	mg/kg	2.36E+02	4.68E-03	1.11E+00	2.03E+02	N	No	BSL
7440-48-4	**COBALT**	**mg/kg**	**2.94E+01**	**9.67E-03**	**2.84E-01**	**4.06E-02**	**N**	**Yes**	**ASL**
7440-50-8	COPPER	mg/kg	1.72E+02	7.75E-03	1.33E+00	5.41E+00	N	No	BSL
7439-89-6	**IRON**	**mg/kg**	**7.64E+04**	**4.63E-03**	**3.54E+02**	**9.46E+01**	**N**	**Yes**	**ASL**
7439-92-1	LEAD	mg/kg	2.75E+02	3.62E-03	9.97E-01	NA	C	No	BSL
7439-96-5	MANGANESE	mg/kg	1.27E+03	5.47E-03	6.95E+00	1.89E+01	N	No	BSL
7439-97-6	MERCURY	mg/kg	6.86E-01	1.43E-02	9.81E-03	1.35E-02	N	No	BSL
7440-02-0	NICKEL	mg/kg	4.27E+01	1.14E-02	4.86E-01	2.70E+00	N	No	BSL
7782-49-2	SELENIUM	mg/kg	4.61E+00	5.24E-02	2.42E-01	6.76E-01	N	No	BSL
7440-22-4	SILVER	mg/kg	1.39E+00	2.02E-02	2.80E-02	6.76E-01	N	No	BSL
7440-28-0	THALLIUM	mg/kg	5.50E-01	1.39E-02	7.65E-03	NA	C	No	BSL
7440-31-5	TIN	mg/kg	8.52E+01	8.48E-03	7.23E-01	8.11E+01	N	No	BSL
7440-62-2	**VANADIUM**	**mg/kg**	**1.16E+02**	**5.41E-02**	**6.29E+00**	**6.81E-01**	**N**	**Yes**	**ASL**
7440-66-6	ZINC	mg/kg	9.99E+02	2.45E-02	2.45E+01	4.06E+01	N	No	BSL

TABLE 6.2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
PAHS									
90-12-0	**1-METHYLNAPHTHALENE**	**mg/kg**	**1.33E+00**	**1.69E-01**	**2.24E-01**	**1.09E-01**	**C**	**Yes**	**ASL**
91-57-6	2-METHYLNAPHTHALENE	mg/kg	2.26E+00	3.50E-02	7.91E-02	5.41E-01	N	No	BSL
83-32-9	ACENAPHTHENE	mg/kg	3.37E+00	8.48E-02	2.86E-01	8.11E+00	N	No	BSL
208-96-8	ACENAPHTHYLENE	mg/kg	5.97E+00	5.02E-02	2.99E-01	2.70E+00	N	No	BSL
120-12-7	ANTHRACENE	mg/kg	8.93E+00	8.24E-02	7.36E-01	4.06E+01	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**mg/kg**	**1.37E+01**	**1.49E-01**	**2.04E+00**	**4.32E-03**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**mg/kg**	**1.25E+01**	**7.31E-02**	**9.17E-01**	**4.32E-04**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**mg/kg**	**1.27E+01**	**4.74E-02**	**6.00E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	mg/kg	7.11E+00	2.33E-02	1.66E-01	4.06E+00	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	mg/kg	4.55E+00	0.00E+00	0.00E+00	4.32E-02	C	No	BSL
218-01-9	**CHRYSENE**	**mg/kg**	**1.27E+01**	**1.45E-01**	**1.84E+00**	**4.32E-01**	**C**	**Yes**	**ASL**
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**mg/kg**	**2.46E+00**	**1.78E-01**	**4.37E-01**	**4.32E-04**	**C**	**Yes**	**ASL**
206-44-0	**FLUORANTHENE**	**mg/kg**	**3.02E+01**	**3.10E-01**	**9.37E+00**	**5.41E+00**	**N**	**Yes**	**ASL**
86-73-7	FLUORENE	mg/kg	2.91E+00	2.79E-02	8.11E-02	5.41E+00	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**mg/kg**	**6.97E+00**	**5.66E-02**	**3.94E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
91-20-3	**NAPHTHALENE**	**mg/kg**	**2.15E+03**	**1.75E-02**	**3.76E+01**	**2.70E+00**	**N**	**Yes**	**ASL**
85-01-8	PHENANTHRENE	mg/kg	1.47E+01	7.59E-02	1.11E+00	4.06E+01	N	No	BSL
129-00-0	**PYRENE**	**mg/kg**	**1.57E+01**	**3.45E-01**	**5.41E+00**	**4.06E+00**	**N**	**Yes**	**ASL**
PCB CONGENERS									
PCBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**2.65E-01**	**6.90E+00**	**1.83E+00**	**2.43E-07**	**C**	**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS									
71-43-2	**BENZENE**	**mg/kg**	**7.90E-02**	**1.00E+00**	**7.90E-02**	**5.74E-02**	**C**	**Yes**	**ASL**
100-41-4	ETHYLBENZENE	mg/kg	4.90E-03	1.00E+00	4.90E-03	2.87E-01	C	No	BSL
75-09-2	METHYLENE CHLORIDE	mg/kg	3.60E-03	1.00E+00	3.60E-03	4.21E-01	C	No	BSL
108-88-3	TOLUENE	mg/kg	5.70E-02	1.00E+00	5.70E-02	1.08E+01	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening is determined by multiplying the sediment exposure point concentration by the bioaccumulation factors (BAFs). Modeled crab concentrations reflect wet weight concentrations.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 6.2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Surface Water EPC Value (µg/L)	BAF	Concentration[1] Used for Screening (mg/kg)	Screening [2] Toxicity Value (mg/kg)		COPC Flag	Rationale for [3] Contaminant Deletion or Selection
METALS								
7429-90-5	ALUMINUM	4.23E+01	2.70E+00	1.14E-01	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	2.09E-01	1.00E+00	2.09E-04	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**4.38E+00**	**4.00E+00**	**1.75E-02**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	4.70E-02	6.20E+01	2.91E-03	2.70E-01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	3.70E+00	2.00E+02	7.40E-01	2.03E+02	N	No	BSL
7440-48-4	COBALT	3.94E-01	1.00E+00	3.94E-04	4.06E-02	N	No	BSL
7440-50-8	COPPER	2.34E+00	4.64E+02	1.09E+00	5.41E+00	N	No	BSL
7439-89-6	IRON	1.04E+02	1.00E+00	1.04E-01	9.46E+01	N	No	BSL
7439-92-1	LEAD	1.62E-01	4.50E+01	7.29E-03	NA	C	No	NSL
7439-96-5	**MANGANESE**	**7.01E+01**	**4.00E+02**	**2.80E+01**	**1.89E+01**	**N**	**Yes**	**ASL**
7439-97-6	**MERCURY**	**5.73E-02**	**1.80E+03**	**1.03E-01**	**1.35E-02**	**N**	**Yes**	**ASL**
7440-02-0	NICKEL	6.36E+00	2.70E+01	1.72E-01	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	**1.35E+01**	**2.42E+02**	**3.26E+00**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-28-0	THALLIUM	5.62E-02	1.00E+03	5.62E-02	NA	C	No	NSL
7440-31-5	TIN	2.45E+00	3.00E+03	7.36E+00	8.11E+01	N	No	BSL
7440-62-2	VANADIUM	1.08E+00	1.00E+00	1.08E-03	6.81E-01	N	No	BSL
7440-66-6	ZINC	1.64E+01	1.30E+01	2.14E-01	4.06E+01	N	No	BSL

TABLE 6.2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Coke Point Offshore Area

CAS Number	Chemical	Surface Water EPC Value (µg/L)	BAF	Concentration[1] Used for Screening (mg/kg)	Screening [2] Toxicity Value (mg/kg)		COPC Flag	Rationale for [3] Contaminant Deletion or Selection
PAHS								
90-12-0	1-METHYLNAPHTHALENE	6.77E-02	1.66E+02	1.12E-02	1.09E-01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	8.77E-02	1.64E+02	1.44E-02	5.41E-01	N	No	BSL
83-32-9	ACENAPHTHENE	5.35E-02	1.79E+02	9.58E-03	8.11E+00	N	No	BSL
208-96-8	ACENAPHTHYLENE	6.96E-02	1.85E+02	1.29E-02	2.70E+00	N	No	BSL
120-12-7	ANTHRACENE	1.37E-01	4.01E+02	5.49E-02	4.06E+01	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**9.80E-01**	**5.83E+02**	**5.71E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**7.59E-01**	**5.83E+02**	**4.42E-01**	**4.32E-04**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**9.84E-01**	**5.83E+02**	**5.74E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	1.13E+00	5.83E+02	6.60E-01	4.06E+00	N	No	BSL
207-08-9	**BENZO(K)FLUORANTHENE**	**1.02E+00**	**5.83E+02**	**5.95E-01**	**4.32E-02**	**C**	**Yes**	**ASL**
218-01-9	**CHRYSENE**	**1.09E+00**	**5.83E+02**	**6.33E-01**	**4.32E-01**	**C**	**Yes**	**ASL**
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**1.22E+00**	**5.83E+02**	**7.11E-01**	**4.32E-04**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	4.32E-01	5.83E+02	2.52E-01	5.41E+00	N	No	BSL
86-73-7	FLUORENE	6.07E-02	2.66E+02	1.61E-02	5.41E+00	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**1.16E+00**	**5.83E+02**	**6.74E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	1.27E+00	6.99E+01	8.88E-02	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	1.43E-01	1.87E+03	2.67E-01	4.06E+01	N	No	BSL
129-00-0	PYRENE	4.55E-01	5.83E+02	2.65E-01	4.06E+00	N	No	BSL
VOLATILE ORGANIC COMPOUNDS								
95-50-1	1,2-DICHLOROBENZENE	2.90E+00	8.51E+01	2.47E-01	1.22E+01	N	No	BSL
71-43-2	**BENZENE**	**1.25E+01**	**1.18E+01**	**1.47E-01**	**5.74E-02**	**C**	**Yes**	**ASL**
67-66-3	CHLOROFORM	1.00E+00	9.26E+00	9.26E-03	1.02E-01	C	No	BSL
100-41-4	ETHYLBENZENE	2.59E+00	5.56E+01	1.44E-01	2.87E-01	C	No	BSL
108-88-3	TOLUENE	2.79E+00	2.94E+01	8.20E-02	1.08E+01	N	No	BSL
1330-20-7	XYLENES (TOTAL)	4.44E+00	5.32E+01	2.36E-01	2.70E+01	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening is determined by multiplying the surface water exposure point concentration by the bioaccumulation factors (BAFs) and a conversion factor 1E-03 mg/µg.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram
µg/L = micrograms per liter

TABLE 6.2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for (5) Contaminant Deletion or Selection
DIOXINS															
WHOTEQNDD	WHO TEQ (ND=DL)	7.84E-07		1.15E-05		mg/kg	BKGD-SED-01-00_10	6/6	0.00E+00 - 0.00E+00	1.15E-05	NA	5.03E-04		No	BSL
METALS															
7429-90-5	ALUMINUM	4.39E+03		2.04E+04		mg/kg	BKGD-SED-01-00_10	3/3	2.00E+00 - 4.90E+00	2.04E+04	NA	NA		No	NSL
7440-36-0	ANTIMONY	2.10E-01	L	1.70E+00	L	mg/kg	BKGD-SED-01-00_10	3/3	1.30E-01 - 3.30E-01	1.70E+00	NA	2.35E+02	N	No	BSL
7440-38-2	ARSENIC	2.20E+00		1.62E+01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 1.00E+00	1.62E+01	NA	4.36E+01	C	No	BSL
7440-39-3	BARIUM	5.10E+00	J	1.32E+01	J	mg/kg	EH-4	3/3	1.90E+01 - 2.01E+01	1.32E+01	NA	5.49E+04	N	No	BSL
7440-41-7	BERYLLIUM	4.60E-01		1.70E+00		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	1.70E+00	NA	5.49E+01	N	No	BSL
7440-43-9	CADMIUM	8.30E-02	J	1.60E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 5.00E-01	1.60E+00	NA	9.80E+02	N	No	BSL
7440-47-3	CHROMIUM	2.28E+01		2.25E+02		mg/kg	BKGD-SED-01-00_10	6/6	1.30E-01 - 5.00E-01	2.25E+02	NA	7.64E+04	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	4.60E-01	B	8.00E-01		mg/kg	EH-4	3/3	5.00E-01 - 5.10E-01	8.00E-01	NA	7.64E+04	N	No	BSL
7440-48-4	COBALT	7.80E+00		1.98E+01		mg/kg	BKGD-SED-01-00_10	3/3	3.30E-02 - 8.20E-02	1.98E+01	NA	1.18E+03	N	No	BSL
7440-50-8	COPPER	4.60E+00		1.05E+02		mg/kg	BKGD-SED-01-00_10	6/6	1.30E-01 - 2.50E+00	1.05E+02	NA	1.57E+05	N	No	BSL
57-12-5	CYANIDE	3.90E-01	B J	4.10E-01	BJ	mg/kg	EH-2 / EH-4	3/6	6.30E-01 - 1.60E+00	4.10E-01	NA	1.68E+05	N	No	BSL
7439-89-6	IRON	3.30E+03		4.38E+04		mg/kg	BKGD-SED-01-00_10	6/6	3.30E+00 - 1.00E+01	4.38E+04	NA	NA		No	NSL
7439-92-1	LEAD	6.80E+00		1.21E+02		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 6.00E-01	1.21E+02	NA	NA		No	NSL
7439-96-5	MANGANESE	4.51E+02		1.26E+03		mg/kg	BKGD-SED-03-00_10	3/3	3.30E-02 - 8.20E-02	1.26E+03	NA	3.76E+03	N	No	BSL
7439-97-6	MERCURY	1.40E-02	J	3.90E-01		mg/kg	BKGD-SED-01-00_10	5/6	2.20E-02 - 5.40E-02	3.90E-01	NA	8.23E+01	N	No	BSL
7440-02-0	NICKEL	2.50E+00	J	3.74E+01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 4.00E+00	3.74E+01	NA	3.13E+03	N	No	BSL
7782-49-2	SELENIUM	5.00E-01		2.40E+00		mg/kg	BKGD-SED-01-00_10	3/6	3.30E-01 - 1.00E+00	2.40E+00	NA	1.96E+04	N	No	BSL
7440-22-4	SILVER	3.80E-02	J	9.40E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.60E-02 - 5.00E-01	9.40E-01	NA	7.84E+02	N	No	BSL
7440-28-0	THALLIUM	6.20E-02	J	2.80E-01		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	2.80E-01	NA	NA		No	NSL
7440-31-5	TIN	2.80E+00		3.85E+01		mg/kg	BKGD-SED-01-00_10	3/3	3.30E-01 - 8.20E-01	3.85E+01	NA	NA		No	NSL
7440-62-2	VANADIUM	2.14E+01		9.44E+01		mg/kg	BKGD-SED-01-00_10	3/3	6.60E-02 - 1.60E-01	9.44E+01	NA	1.96E+04	N	No	BSL
7440-66-6	ZINC	3.01E+01		4.29E+02		mg/kg	BKGD-SED-01-00_10	6/6	3.30E-01 - 2.00E+00	4.29E+02	NA	NA		No	NSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	2.10E-03	J	3.30E-01		mg/kg	BKGD-SED-01-00_10	3/6	6.30E-03 - 1.10E-01	3.30E-01	NA	5.20E+02	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	2.40E-03	J	6.30E-01		mg/kg	BKGD-SED-01-00_10	5/6	6.30E-03 - 1.10E-01	6.30E-01	NA	1.21E+03	N	No	BSL
83-32-9	ACENAPHTHENE	1.60E-02	J	4.40E-01		mg/kg	BKGD-SED-01-00_10	2/6	6.30E-03 - 1.10E-01	4.40E-01	NA	1.81E+04	N	No	BSL
208-96-8	ACENAPHTHYLENE	1.10E-02	J	3.80E-01		mg/kg	BKGD-SED-01-00_10	3/6	6.30E-03 - 1.10E-01	3.80E-01	NA	1.81E+04	C	No	BSL
120-12-7	ANTHRACENE	1.80E-03	J	6.50E-01		mg/kg	BKGD-SED-01-00_10	5/6	6.30E-03 - 5.30E-01	6.50E-01	NA	9.04E+04	N	No	BSL
56-55-3	BENZO(A)ANTHRACENE	3.70E-03	J	1.20E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.20E+00	NA	9.61E+00	C	No	BSL
50-32-8	**BENZO(A)PYRENE**	**3.70E-03**	**J**	**1.10E+00**		**mg/kg**	**BKGD-SED-01-00_10**	**6/6**	**6.30E-03 - 1.10E-01**	**1.10E+00**	**NA**	**9.61E-01**	**C**	**Yes**	**ASL**
205-99-2	BENZO(B)FLUORANTHENE	5.60E-03	J	1.90E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.90E+00	NA	9.61E+00	C	No	BSL
191-24-2	BENZO(GHI)PERYLENE	4.70E-03	J / J	8.30E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.30E-01	NA	9.04E+03	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	6.50E-03		2.70E-02	J	mg/kg	BKGD-SED-03-00_10	3/6	6.30E-03 - 1.10E-01	2.70E-02	NA	9.61E+01	C	No	BSL
218-01-9	CHRYSENE	3.80E-03	J	1.00E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.00E+00	NA	9.61E+02	C	No	BSL
53-70-3	DIBENZO(A,H)ANTHRACENE	2.60E-03	J	2.60E-01		mg/kg	BKGD-SED-01-00_10	4/6	6.30E-03 - 1.10E-01	2.60E-01	NA	9.61E-01	C	No	BSL
206-44-0	FLUORANTHENE	3.90E-03	J	2.20E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	2.20E+00	NA	1.21E+04	N	No	BSL
86-73-7	FLUORENE	2.10E-03	J	6.30E-01		mg/kg	BKGD-SED-01-00_10	4/6	6.30E-03 - 1.10E-01	6.30E-01	NA	1.21E+04	N	No	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	3.70E-03	J	8.70E-01		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.70E-01	NA	9.61E+00	C	No	BSL
91-20-3	NAPHTHALENE	4.90E-03	J	8.30E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	8.30E+00	NA	6.03E+03	C	No	BSL
85-01-8	PHENANTHRENE	3.40E-03	J	2.00E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	2.00E+00	NA	9.04E+03	N	No	BSL
129-00-0	PYRENE	5.10E-03	J	1.40E+00		mg/kg	BKGD-SED-01-00_10	6/6	6.30E-03 - 1.10E-01	1.40E+00	NA	9.04E+03	N	No	BSL

TABLE 6.2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value	COPC Flag	Rationale for (5) Contaminant Deletion or Selection
PCB CONGENERS														
PCBs	**TOTAL PCBs (ND=DL)**	**6.96E-03**		**5.83E-02**		**mg/kg**	**BKGD-SED-01-00_10**	**6/6**	**2.60E-04 - 2.60E-04**	**5.83E-02**	**NA**	**1.08E-03**	**Yes**	**ASL**
VOLATILE ORGANIC COMPOUNDS														
75-09-2	METHYLENE CHLORIDE	3.40E-03	J	3.40E-03	J	mg/kg	EH-4	1/6	6.30E-03 - 1.60E-02	3.40E-03	NA	NA	No	NSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

Data Qualifiers:
B = Value is estimated.
J = Value is estimated.
L = Reported value may be biased low.

TABLE 6.2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Patapsco River Background

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration (2) Used for Screening	Background (3) Value	Screening (4) Toxicity Value		COPC Flag	Rationale for (5) Contaminant Deletion or Selection
METALS															
7429-90-5	ALUMINUM	2.59E+01	J	1.06E+02		µg/L	BKGD-W-01-D_10	9/9	2.60E+00 - 2.60E+00	1.06E+02	NA	1.24E+06	N	No	BSL
7440-36-0	ANTIMONY	1.20E-01	J	3.00E-01	J	µg/L	BKGD-W-01-D_10	9/9	1.90E-02 - 1.90E-02	3.00E-01	NA	7.44E+01	N	No	BSL
7440-38-2	ARSENIC	2.60E+00		6.40E+00		µg/L	BKGD-W-01-D_10	9/9	2.90E-01 - 2.90E-01	6.40E+00	NA	1.93E+01	C	No	BSL
7440-41-7	BERYLLIUM	3.80E-02	J	3.80E-02	J	µg/L	BKGD-W-01-D_10	1/9	3.70E-02 - 3.70E-02	3.80E-02	NA	1.74E+01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	3.40E+00		1.42E+01		µg/L	BKGD-W-01-D_10	9/9	5.40E-01 - 5.40E-01	1.42E+01	NA	2.42E+04	N	No	BSL
7440-48-4	COBALT	2.60E-01	J	6.80E-01		µg/L	BKGD-W-01-D_10	9/9	2.60E-02 - 2.60E-02	6.80E-01	NA	9.31E+02	N	No	BSL
7440-50-8	COPPER	1.90E+00	J	2.60E+00		µg/L	BKGD-W-01-D_10	9/9	2.40E-01 - 2.40E-01	2.60E+00	NA	4.96E+04	N	No	BSL
7439-89-6	IRON	7.02E+01	B	2.46E+02		µg/L	BKGD-W-01-D_10	9/9	6.10E+00 - 6.10E+00	2.46E+02	NA	8.69E+05	N	No	BSL
7439-92-1	LEAD	2.10E-02	J	4.60E-01	J	µg/L	BKGD-W-01-D_10	8/9	1.90E-02 - 1.90E-02	4.60E-01	NA	1.50E+01		No	BSL
7439-96-5	MANGANESE	2.09E+01		8.54E+01		µg/L	BKGD-W-01-D_10	9/9	3.90E-02 - 3.90E-02	8.54E+01	NA	1.19E+03	N	No	BSL
7439-97-6	MERCURY	3.90E-02	B	3.90E-02	B	µg/L	BKGD-W-01-S_10 / BKGD-W-03-S_10 / BKGD-W-02-D_10	3/9	3.80E-02 - 3.80E-02	3.90E-02	NA	2.61E+01	N	No	BSL
7440-02-0	NICKEL	4.30E+00		6.60E+00		µg/L	BKGD-W-02-D_10	9/9	1.70E-01 - 1.70E-01	6.60E+00	NA	4.96E+03	N	No	BSL
7782-49-2	SELENIUM	6.60E+00		1.71E+01		µg/L	BKGD-W-02-D_10	9/9	4.20E-01 - 4.20E-01	1.71E+01	NA	6.20E+03	N	No	BSL
7440-28-0	THALLIUM	2.20E-02	J	1.00E-01	J	µg/L	BKGD-W-01-M_10	4/9	1.50E-02 - 1.50E-02	1.00E-01	NA	NA		No	NSL
7440-31-5	TIN	2.90E+00	J	3.70E+00	J	µg/L	BKGD-W-01-M_10	3/9	1.50E+00 - 1.50E+00	3.70E+00	NA	7.44E+05	N	No	BSL
7440-62-2	VANADIUM	5.30E-01	B	2.10E+00		µg/L	BKGD-W-02-M_10	8/9	8.20E-02 - 8.20E-02	2.10E+00	NA	6.20E+03	N	No	BSL
7440-66-6	ZINC	3.60E+00	J	9.00E+00		µg/L	BKGD-W-01-D_10	9/9	9.60E-01 - 9.60E-01	9.00E+00	NA	6.20E+05	N	No	BSL
PAHS															
90-12-0	1-METHYLNAPHTHALENE	3.80E-02	J	6.70E-02	J	µg/L	BKGD-W-03-S_10	2/9	1.60E-02 - 1.70E-02	6.70E-02	NA	1.07E+01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	1.60E-02	J	1.50E-01	J	µg/L	BKGD-W-03-S_10	4/9	1.50E-02 - 1.60E-02	1.50E-01	NA	5.41E+01	N	No	BSL
83-32-9	ACENAPHTHENE	1.70E-02	J	1.70E-02	J	µg/L	BKGD-W-01-D_10	1/9	1.40E-02 - 1.40E-02	1.70E-02	NA	8.66E+02	N	No	BSL
120-12-7	ANTHRACENE	2.40E-02	J	2.40E-02	J	µg/L	BKGD-W-01-D_10	1/9	8.10E-03 - 8.60E-03	2.40E-02	NA	2.62E+03	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**3.50E-02**	**J**	**1.40E-01**	**J**	**µg/L**	**BKGD-W-01-D_10**	**2/9**	**1.70E-02 - 1.80E-02**	**1.40E-01**	**NA**	**8.44E-02**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**4.50E-02**	**J**	**5.10E-02**	**J**	**µg/L**	**BKGD-W-01-D_10**	**2/9**	**1.10E-02 - 1.20E-02**	**5.10E-02**	**NA**	**5.67E-03**	**C**	**Yes**	**ASL**
205-99-2	BENZO(B)FLUORANTHENE	4.20E-02	J	4.90E-02	J	µg/L	BKGD-W-01-M_10	2/9	1.50E-02 - 1.60E-02	4.90E-02	NA	5.67E-02	C	No	BSL
191-24-2	BENZO(GHI)PERYLENE	7.40E-02	J	7.40E-02	J	µg/L	BKGD-W-01-M_10	1/9	8.10E-03 - 8.70E-03	7.40E-02	NA	3.32E+01	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	6.50E-02	J	6.90E-02	J	µg/L	BKGD-W-01-M_10	2/9	1.50E-02 - 1.60E-02	6.90E-02	NA	5.74E-01	C	No	BSL
218-01-9	CHRYSENE	3.60E-02	J	1.10E-01	J	µg/L	BKGD-W-01-D_10	2/9	1.00E-02 - 1.10E-02	1.10E-01	NA	6.65E+00	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**7.30E-02**	**J**	**7.30E-02**	**J**	**µg/L**	**BKGD-W-01-M_10**	**1/9**	**1.20E-02 - 1.30E-02**	**7.30E-02**	**NA**	**2.64E-03**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	1.30E-02	J	5.60E-01		µg/L	BKGD-W-01-D_10	4/9	9.40E-03 - 1.00E-02	5.60E-01	NA	2.26E+02	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**7.30E-02**	**J**	**7.30E-02**	**J**	**µg/L**	**BKGD-W-01-M_10**	**1/9**	**1.50E-02 - 1.60E-02**	**7.30E-02**	**NA**	**3.97E-02**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	4.20E-02	J	3.60E-01		µg/L	BKGD-W-03-S_10	5/9	2.60E-02 - 2.80E-02	3.60E-01	NA	5.28E+02	C	No	BSL
85-01-8	PHENANTHRENE	5.70E-02	J	1.30E-01	J	µg/L	BKGD-W-03-M_10	5/9	2.70E-02 - 2.80E-02	1.30E-01	NA	2.66E+02	N	No	BSL
129-00-0	PYRENE	1.20E-02	J	3.10E-01		µg/L	BKGD-W-01-D_10	2/9	1.00E-02 - 1.10E-02	3.10E-01	NA	1.85E+02	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) Minimum/maximum detected concentration.
(2) Maximum concentration used as screening value.
(3) Background values are not included as part of the COPC selection process.
(4) Site-specific Screening Toxicity Values developed Please see Appendix D for calculations.
(5) Rationale Codes

Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level
NSL = No Screening Toxicity Level

Definitions:
C = Carcinogenic
COPC = Chemical of Potential Concern
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
µg/L = micrograms per liter

Data Qualifiers:
J = Value is estimated.
L = Reported value may be biased low.

TABLE 6.2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crab
Exposure Point: Patapsco River Background

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening	Screening (2) Toxicity Value		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
DIOXINS									
WHOTEQNDDL	**WHO TEQ (ND=DL)**	**mg/kg**	**8.17E-06**	**2.35E-01**	**1.92E-06**	**2.43E-08**	**C**	**Yes**	**ASL**
METALS									
7429-90-5	ALUMINUM	mg/kg	2.04E+04	4.00E-03	8.16E+01	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	mg/kg	1.70E+00	3.15E-02	5.35E-02	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**mg/kg**	**1.07E+01**	**5.41E-02**	**5.79E-01**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	mg/kg	1.70E+00	3.25E-03	5.53E-03	2.70E-01	N	No	BSL
7440-43-9	CADMIUM	mg/kg	1.35E+00	7.76E-03	1.05E-02	1.35E-01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	mg/kg	2.04E+02	4.68E-03	9.56E-01	2.03E+02	N	No	BSL
7440-48-4	**COBALT**	**mg/kg**	**1.98E+01**	**9.67E-03**	**1.91E-01**	**4.06E-02**	**N**	**Yes**	**ASL**
7440-50-8	COPPER	mg/kg	9.16E+01	7.75E-03	7.10E-01	5.41E+00	N	No	BSL
7439-89-6	**IRON**	**mg/kg**	**2.74E+04**	**4.63E-03**	**1.27E+02**	**9.46E+01**	**N**	**Yes**	**ASL**
7439-92-1	LEAD	mg/kg	1.06E+02	3.62E-03	3.83E-01	NA	C	No	NSL
7439-96-5	MANGANESE	mg/kg	1.26E+03	5.47E-03	6.89E+00	1.89E+01	N	No	BSL
7439-97-6	MERCURY	mg/kg	2.27E-01	1.43E-02	3.25E-03	1.35E-02	N	No	BSL
7440-02-0	NICKEL	mg/kg	2.45E+01	1.14E-02	2.79E-01	2.70E+00	N	No	BSL
7782-49-2	SELENIUM	mg/kg	2.40E+00	5.24E-02	1.26E-01	6.76E-01	N	No	BSL
7440-22-4	SILVER	mg/kg	8.58E-01	2.02E-02	1.74E-02	6.76E-01	N	No	BSL
7440-28-0	THALLIUM	mg/kg	2.80E-01	1.39E-02	3.89E-03	NA	C	No	NSL
7440-31-5	TIN	mg/kg	3.85E+01	8.48E-03	3.26E-01	8.11E+01	N	No	BSL
7440-62-2	**VANADIUM**	**mg/kg**	**9.44E+01**	**5.41E-02**	**5.11E+00**	**6.81E-01**	**N**	**Yes**	**ASL**
7440-66-6	ZINC	mg/kg	3.76E+02	2.45E-02	9.20E+00	4.06E+01	N	No	BSL

TABLE 6.2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crab
Exposure Point: Patapsco River Background

CAS Number	Chemical	Units	Sediment EPC Value (mg/kg)	BAF	Concentration (1) Used for Screening	Screening (2) Toxicity Value		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
PAHS									
90-12-0	1-METHYLNAPHTHALENE	mg/kg	3.30E-01	1.69E-01	5.58E-02	1.09E-01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	mg/kg	5.74E-01	3.50E-02	2.01E-02	5.41E-01	N	No	BSL
83-32-9	ACENAPHTHENE	mg/kg	4.40E-01	8.48E-02	3.73E-02	8.11E+00	N	No	BSL
208-96-8	ACENAPHTHYLENE	mg/kg	3.80E-01	5.02E-02	1.91E-02	2.70E+00	N	No	BSL
120-12-7	ANTHRACENE	mg/kg	5.92E-01	8.24E-02	4.88E-02	4.06E+01	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**mg/kg**	**1.20E+00**	**1.49E-01**	**1.79E-01**	**4.32E-03**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**mg/kg**	**1.10E+00**	**7.31E-02**	**8.04E-02**	**4.32E-04**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**mg/kg**	**1.90E+00**	**4.74E-02**	**9.00E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	mg/kg	8.30E-01	2.33E-02	1.93E-02	4.06E+00	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	mg/kg	2.70E-02	0.00E+00	0.00E+00	4.32E-02	C	No	BSL
218-01-9	CHRYSENE	mg/kg	1.00E+00	1.45E-01	1.45E-01	4.32E-01	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**mg/kg**	**1.49E-01**	**1.78E-01**	**2.65E-02**	**4.32E-04**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	mg/kg	2.20E+00	3.10E-01	6.82E-01	5.41E+00	N	No	BSL
86-73-7	FLUORENE	mg/kg	3.22E-01	2.79E-02	8.99E-03	5.41E+00	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**mg/kg**	**8.70E-01**	**5.66E-02**	**4.92E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	mg/kg	8.30E+00	1.75E-02	1.45E-01	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	mg/kg	2.00E+00	7.59E-02	1.52E-01	4.06E+01	N	No	BSL
129-00-0	PYRENE	mg/kg	1.40E+00	3.45E-01	4.84E-01	4.06E+00	N	No	BSL
PCB CONGENERS									
PCBs	**TOTAL PCBs (ND=DL)**	**mg/kg**	**5.32E-02**	**6.90E+00**	**3.67E-01**	**2.43E-07**	**C**	**Yes**	**ASL**

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening is determined by multiplying the sediment exposure point concentration by the bioaccumulation factors (BAFs). Modeled crab concentrations reflect wet weight concentrations.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes Selection Reason: ASL = Above Screening Toxicity Level
Deletion Reason: BSL = Below Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 6.2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Patapsco River Background

CAS Number	Chemical	Surface Water EPC Value (µg/L)	BAF	Concentration (1) Used for Screening (mg/kg)	Screening (2) Toxicity Value (mg/kg)		COPC Flag	Rationale for (3) Contaminant Deletion or Selection
METALS								
7429-90-5	ALUMINUM	8.59E+01	2.70E+00	2.32E-01	1.35E+02	N	No	BSL
7440-36-0	ANTIMONY	2.53E-01	1.00E+00	2.53E-04	5.41E-02	N	No	BSL
7440-38-2	**ARSENIC**	**4.69E+00**	**4.00E+00**	**1.87E-02**	**2.10E-03**	**C**	**Yes**	**ASL**
7440-41-7	BERYLLIUM	3.80E-02	6.20E+01	2.36E-03	2.70E-01	N	No	BSL
16065-83-1	CHROMIUM, TRIVALENT	1.26E+01	2.00E+02	2.51E+00	2.03E+02	N	No	BSL
7440-48-4	COBALT	4.83E-01	1.00E+00	4.83E-04	4.06E-02	N	No	BSL
7440-50-8	COPPER	2.35E+00	4.64E+02	1.09E+00	5.41E+00	N	No	BSL
7439-89-6	IRON	1.54E+02	1.00E+00	1.54E-01	9.46E+01	N	No	BSL
7439-92-1	LEAD	3.52E-01	4.50E+01	1.58E-02	NA	C	No	NSL
7439-96-5	**MANGANESE**	**8.14E+01**	**4.00E+02**	**3.26E+01**	**1.89E+01**	**N**	**Yes**	**ASL**
7439-97-6	**MERCURY**	**3.90E-02**	**1.80E+03**	**7.02E-02**	**1.35E-02**	**N**	**Yes**	**ASL**
7440-02-0	NICKEL	5.66E+00	2.70E+01	1.53E-01	2.70E+00	N	No	BSL
7782-49-2	**SELENIUM**	**1.26E+01**	**2.42E+02**	**3.04E+00**	**6.76E-01**	**N**	**Yes**	**ASL**
7440-28-0	THALLIUM	9.11E-02	1.00E+03	9.11E-02	NA	C	No	NSL
7440-31-5	TIN	3.70E+00	3.00E+03	1.11E+01	8.11E+01	N	No	BSL
7440-62-2	VANADIUM	1.52E+00	1.00E+00	1.52E-03	6.81E-01	N	No	BSL
7440-66-6	ZINC	6.64E+00	1.30E+01	8.63E-02	4.06E+01	N	No	BSL
PAHS								
90-12-0	1-METHYLNAPHTHALENE	6.70E-02	1.66E+02	1.11E-02	1.09E-01	C	No	BSL
91-57-6	2-METHYLNAPHTHALENE	1.23E-01	1.64E+02	2.02E-02	5.41E-01	N	No	BSL
83-32-9	ACENAPHTHENE	1.70E-02	1.79E+02	3.04E-03	8.11E+00	N	No	BSL
120-12-7	ANTHRACENE	2.40E-02	4.01E+02	9.62E-03	4.06E+01	N	No	BSL
56-55-3	**BENZO(A)ANTHRACENE**	**1.40E-01**	**5.83E+02**	**8.16E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
50-32-8	**BENZO(A)PYRENE**	**5.10E-02**	**5.83E+02**	**2.97E-02**	**4.32E-04**	**C**	**Yes**	**ASL**
205-99-2	**BENZO(B)FLUORANTHENE**	**4.90E-02**	**5.83E+02**	**2.86E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
191-24-2	BENZO(GHI)PERYLENE	7.40E-02	5.83E+02	4.31E-02	4.06E+00	N	No	BSL
207-08-9	BENZO(K)FLUORANTHENE	6.90E-02	5.83E+02	4.02E-02	4.32E-02	C	No	BSL
218-01-9	CHRYSENE	1.10E-01	5.83E+02	6.41E-02	4.32E-01	C	No	BSL
53-70-3	**DIBENZO(A,H)ANTHRACENE**	**7.30E-02**	**5.83E+02**	**4.26E-02**	**4.32E-04**	**C**	**Yes**	**ASL**
206-44-0	FLUORANTHENE	4.88E-01	5.83E+02	2.85E-01	5.41E+00	N	No	BSL
193-39-5	**INDENO(1,2,3-CD)PYRENE**	**7.30E-02**	**5.83E+02**	**4.26E-02**	**4.32E-03**	**C**	**Yes**	**ASL**
91-20-3	NAPHTHALENE	1.73E-01	6.99E+01	1.21E-02	2.70E+00	N	No	BSL
85-01-8	PHENANTHRENE	1.14E-01	1.87E+03	2.13E-01	4.06E+01	N	No	BSL
129-00-0	PYRENE	3.10E-01	5.83E+02	1.81E-01	4.06E+00	N	No	BSL

Note: Chemicals of Potential Concern are bold with shading

(1) The concentration used for screening is determined by multiplying the surface water exposure point concentration by the bioaccumulation factors (BAFs) and a conversion factor 1E-03 mg/µg.

(2) USEPA Regional Screening Levels, USEPA, December 2009. For non-carcinogens, value shown is equal to 1/10 the tissue value. For carcinogens the value shown is equal to the tissue value.

(3) Rationale Codes — Selection Reason: ASL = Above Screening Toxicity Level; Deletion Reason: BSL = Below Screening Toxicity Level

Definitions:
BAF = Bioaccumulation Factor
C = Carcinogenic
COPC = Chemical of Potential Conc
EPC = Exposure Point Concentratio
N = Non-Carcinogenic
NA = Not Applicable
PAHS = Polycyclic Aromatic Hydro
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram
µg/L = micrograms per liter

TABLE 6.3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DIOXINS									
WHO TEQ (ND=DL)	mg/kg	1.34E-05	2.59E-05	7.77E-05		mg/kg	2.59E-05	95%UCLM-C	CRAB COPC
METALS									
ARSENIC	mg/kg	2.34E+01	2.76E+01	7.20E+01		mg/kg	2.76E+01	95%UCLM-G	SD COPC
COBALT	mg/kg	2.61E+01	2.94E+01	5.30E+01		mg/kg	2.94E+01	95%UCLM-M	CRAB COPC
IRON	mg/kg	6.69E+04	7.64E+04	1.20E+05		mg/kg	7.64E+04	95%UCLM-N	CRAB COPC
VANADIUM	mg/kg	9.38E+01	1.16E+02	1.70E+02		mg/kg	1.16E+02	95%UCLM-G	CRAB COPC
PAHS									
1-METHYLNAPHTHALENE	mg/kg	6.54E-01	1.33E+00	3.30E+00		mg/kg	1.33E+00	95%UCLM-L	CRAB COPC
BENZO(A)ANTHRACENE	mg/kg	9.28E+00	1.37E+01	6.10E+01		mg/kg	1.37E+01	95%UCLM-G	SD COPC
BENZO(A)PYRENE	mg/kg	8.93E+00	1.25E+01	5.60E+01		mg/kg	1.25E+01	95%UCLM-G	SD COPC
BENZO(B)FLUORANTHENE	mg/kg	9.30E+00	1.27E+01	5.30E+01		mg/kg	1.27E+01	95%UCLM-G	SD COPC
CHRYSENE	mg/kg	8.70E+00	1.27E+01	6.30E+01		mg/kg	1.27E+01	95%UCLM-G	CRAB COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	1.43E+00	2.46E+00	6.30E+00		mg/kg	2.46E+00	95%UCLM-KMC	SD COPC
FLUORANTHENE	mg/kg	2.02E+01	3.02E+01	1.40E+02		mg/kg	3.02E+01	95%UCLM-G	CRAB COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	5.01E+00	6.97E+00	2.50E+01		mg/kg	6.97E+00	95%UCLM-G	SD COPC
NAPHTHALENE	mg/kg	2.18E+02	2.15E+03	7.20E+03		mg/kg	2.15E+03	95%UCLM-C	SD COPC
PYRENE	mg/kg	1.10E+01	1.57E+01	5.90E+01		mg/kg	1.57E+01	95%UCLM-G	CRAB COPC
PCB CONGENERS									
TOTAL PCBs (ND=DL)	mg/kg	1.50E-01	2.65E-01	4.89E-01		mg/kg	2.65E-01	95%UCLM-KMC	SD COPC
VOLATILE ORGANIC COMPOUNDS									
BENZENE	mg/kg	3.13E-02	NA	7.90E-02		mg/kg	7.90E-02	LOW %DETECTS	CRAB COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009).
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
95%UCLM-L indicates that the 95 percent upper confidence limit on the mean is based on the Land (H) statistic for lognormal distributions.
95%UCLM-M indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric modified t-test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
LOW %DETECTS indicates low percentage of detects.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram
Data Qualifiers:
J = Value is estimated.
L = Reported value may be biased low.

TABLE 6.3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
METALS									
ARSENIC	µg/L	4.10E+00	4.38E+00	7.60E+00		µg/L	4.38E+00	95%UCLM-N	FISH COPC
MANGANESE	µg/L	4.96E+01	7.01E+01	1.98E+02		µg/L	7.01E+01	95%UCLM-C	FISH COPC
MERCURY	µg/L	4.78E-02	5.73E-02	6.30E-02		µg/L	5.73E-02	95%UCLM-BCA	FISH COPC
SELENIUM	µg/L	1.25E+01	1.35E+01	2.45E+01		µg/L	1.35E+01	95%UCLM-N	FISH COPC
PAHS									
BENZO(A)ANTHRACENE	µg/L	1.44E+00	9.80E-01	8.70E+00		µg/L	9.80E-01	95%UCLM-KMC	SW COPC
BENZO(A)PYRENE	µg/L	1.06E+00	7.59E-01	6.80E+00		µg/L	7.59E-01	95%UCLM-KMC	SW COPC
BENZO(B)FLUORANTHENE	µg/L	1.40E+00	9.84E-01	8.00E+00		µg/L	9.84E-01	95%UCLM-KMC	SW COPC
BENZO(K)FLUORANTHENE	µg/L	1.47E+00	1.02E+00	9.20E+00		µg/L	1.02E+00	95%UCLM-KMC	SW COPC
CHRYSENE	µg/L	1.63E+00	1.09E+00	9.60E+00		µg/L	1.09E+00	95%UCLM-KMC	SW COPC
DIBENZO(A,H)ANTHRACENE	µg/L	1.77E+00	1.22E+00	1.10E+01		µg/L	1.22E+00	95%UCLM-KMC	SW COPC
INDENO(1,2,3-CD)PYRENE	µg/L	1.54E+00	1.16E+00	9.90E+00		µg/L	1.16E+00	95%UCLM-KMC	SW COPC
VOLATILE ORGANIC COMPOUNDS									
BENZENE	µg/L	1.11E+01	1.25E+01	7.20E+01	L	µg/L	1.25E+01	95%UCLM-KMC	SW COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009).
95%UCLM-BCA indicates that the 95 percent upper confidence limit on the mean is based on the Kaplan-Meier (KM) Bias-Corrected Accelerated (BCA) percentile bootstrap test.
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
95%UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detection Limit
µg/L = micrograms per liter
Data Qualifiers:
L = Reported value may be biased low.

TABLE 6.3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
DIOXINS								
WHO TEQ (ND=DL)	mg/kg	NA	NA	NA		mg/kg	6.09E-06	CRAB COPC
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	1.50E+00	CRAB COPC
COBALT	mg/kg	NA	NA	NA		mg/kg	2.84E-01	CRAB COPC
IRON	mg/kg	NA	NA	NA		mg/kg	3.54E+02	CRAB COPC
VANADIUM	mg/kg	NA	NA	NA		mg/kg	6.29E+00	CRAB COPC
PAHS								
1-METHYLNAPHTHALENE	mg/kg	NA	NA	NA		mg/kg	2.24E-01	CRAB COPC
BENZO(A)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	2.04E+00	CRAB COPC
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	9.17E-01	CRAB COPC
BENZO(B)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	6.00E-01	CRAB COPC
CHRYSENE	mg/kg	NA	NA	NA		mg/kg	1.84E+00	CRAB COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	4.37E-01	CRAB COPC
FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	9.37E+00	CRAB COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	NA	NA	NA		mg/kg	3.94E-01	CRAB COPC
NAPHTHALENE	mg/kg	NA	NA	NA		mg/kg	3.76E+01	CRAB COPC
PYRENE	mg/kg	NA	NA	NA		mg/kg	5.41E+00	CRAB COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	NA	NA	NA		mg/kg	1.83E+00	CRAB COPC
VOLATILE ORGANIC COMPOUNDS								
BENZENE	mg/kg	NA	NA	NA		mg/kg	7.90E-02	CRAB COPC

Modeled crab concentrations reflect wet weight concentrations.
Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to sediment.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram

TABLE 6.3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Coke Point Offshore Area

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	1.75E-02	FISH COPC
MANGANESE	mg/kg	NA	NA	NA		mg/kg	2.80E+01	FISH COPC
MERCURY	mg/kg	NA	NA	NA		mg/kg	1.03E-01	FISH COPC
SELENIUM	mg/kg	NA	NA	NA		mg/kg	3.26E+00	FISH COPC
PAHS								
BENZO(A)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	5.71E-01	FISH COPC
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	4.42E-01	FISH COPC
BENZO(B)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	5.74E-01	FISH COPC
BENZO(K)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	5.95E-01	FISH COPC
CHRYSENE	mg/kg	NA	NA	NA		mg/kg	6.33E-01	FISH COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	7.11E-01	FISH COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	NA	NA	NA		mg/kg	6.74E-01	FISH COPC
VOLATILE ORGANIC COMPOUNDS								
BENZENE	mg/kg	NA	NA	NA		mg/kg	1.47E-01	FISH COPC

Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to surface water.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detection Limit
mg/kg = milligrams per kilogram

TABLE 6.3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DIOXINS									
WHO TEQ (ND=DL)	mg/kg	4.42E-06	8.17E-06	1.15E-05		mg/kg	8.17E-06	95%UCLM-N	USEPA Guidance
METALS									
ARSENIC	mg/kg	6.22E+00	1.07E+01	1.62E+01		mg/kg	1.07E+01	95%UCLM-N	USEPA Guidance
COBALT	mg/kg	1.50E+01	NA	1.98E+01		mg/kg	1.98E+01	Maximum	N<5
IRON	mg/kg	1.45E+04	2.74E+04	4.38E+04		mg/kg	2.74E+04	95%UCLM-N	USEPA Guidance
VANADIUM	mg/kg	4.82E+01	NA	9.44E+01		mg/kg	9.44E+01	Maximum	N<5
PAHS									
BENZO(A)ANTHRACENE	mg/kg	2.22E-01	3.43E+00	1.20E+00		mg/kg	1.20E+00	Maximum	UCLM>Maximum
BENZO(A)PYRENE	mg/kg	2.03E-01	3.04E+00	1.10E+00		mg/kg	1.10E+00	Maximum	UCLM>Maximum
BENZO(B)FLUORANTHENE	mg/kg	3.43E-01	5.50E+00	1.90E+00		mg/kg	1.90E+00	Maximum	UCLM>Maximum
DIBENZO(A,H)ANTHRACENE	mg/kg	8.77E-02	1.49E-01	2.60E-01		mg/kg	1.49E-01	95%UCLM-KMp	USEPA Guidance
INDENO(1,2,3-CD)PYRENE	mg/kg	1.73E-01	2.33E+00	8.70E-01		mg/kg	8.70E-01	Maximum	UCLM>Maximum
PCB CONGENERS									
TOTAL PCBs (ND=DL)	mg/kg	1.70E-02	5.32E-02	5.83E-02		mg/kg	5.32E-02	95%UCLM-C	USEPA Guidance

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009).
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-KMp indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) percentile boostrap test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
N < 5 indicates that the number of samples is less than 5, so the maximum detected value is used.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concnetration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 6.3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
METALS									
ARSENIC	ug/L	3.96E+00	4.69E+00	6.40E+00		ug/L	4.69E+00	95%UCLM-N	Regional Guidance
MANGANESE	ug/L	4.37E+01	8.14E+01	8.54E+01		ug/L	8.14E+01	95%UCLM-C	Regional Guidance
MERCURY	ug/L	3.90E-02	NA	3.90E-02	B	ug/L	3.90E-02	Maximum	Low %Detects
SELENIUM	ug/L	1.03E+01	1.26E+01	1.71E+01		ug/L	1.26E+01	95%UCLM-N	Regional Guidance
PAHS									
BENZO(A)ANTHRACENE	ug/L	8.75E-02	NA	1.40E-01	J	ug/L	1.40E-01	Maximum	Low %Detects
BENZO(A)PYRENE	ug/L	4.80E-02	NA	5.10E-02	J	ug/L	5.10E-02	Maximum	Low %Detects
BENZO(B)FLUORANTHENE	ug/L	4.55E-02	NA	4.90E-02	J	ug/L	4.90E-02	Maximum	Low %Detects
DIBENZO(A,H)ANTHRACENE	ug/L	7.30E-02	NA	7.30E-02	J	ug/L	7.30E-02	Maximum	Low %Detects
INDENO(1,2,3-CD)PYRENE	ug/L	7.30E-02	NA	7.30E-02	J	ug/L	7.30E-02	Maximum	Low %Detects

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009).
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
Low %Detects indicates low percentage of detects; therefore, maximum detected concentration is used.
UCLM>Maximum indicates that the recommended 95 UCLM exceeds the maximum detected value, therefore the maximum detected value is used.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concnetration
PAHS = Polycyclic Aromatic Hydrocarbons
ug/L = micrograms per liter

TABLE 6.3.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Shellfish
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
DIOXINS								
WHO TEQ (ND=DL)	mg/kg	NA	NA	NA		mg/kg	1.92E-06	CRAB COPC
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	5.79E-01	CRAB COPC
COBALT	mg/kg	NA	NA	NA		mg/kg	1.91E-01	CRAB COPC
IRON	mg/kg	NA	NA	NA		mg/kg	1.27E+02	CRAB COPC
VANADIUM	mg/kg	NA	NA	NA		mg/kg	5.11E+00	CRAB COPC
PAHS								
BENZO(A)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	1.79E-01	CRAB COPC
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	8.04E-02	CRAB COPC
BENZO(B)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	9.00E-02	CRAB COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	2.65E-02	CRAB COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	NA	NA	NA		mg/kg	4.92E-02	CRAB COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	NA	NA	NA		mg/kg	3.67E-01	CRAB COPC

Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to surface water.
Corg = EPC of chemical in aquatic organism tissue
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concnetration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
mg/kg = milligrams per kilogram

TABLE 6.3.8
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	1.87E-02	FISH COPC
MANGANESE	mg/kg	NA	NA	NA		mg/kg	3.26E+01	FISH COPC
MERCURY	mg/kg	NA	NA	NA		mg/kg	7.02E-02	FISH COPC
SELENIUM	mg/kg	NA	NA	NA		mg/kg	3.04E+00	FISH COPC
PAHS								
BENZO(A)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	8.16E-02	FISH COPC
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	2.97E-02	FISH COPC
BENZO(B)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	2.86E-02	FISH COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	4.26E-02	FISH COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	NA	NA	NA		mg/kg	4.26E-02	FISH COPC

Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to surface water.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
mg/kg = milligrams per kilogram

TABLE 6.4.1
VALUES USED FOR ADULT RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	0.02	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time-Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	18,000	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (1)	For organic compounds
	EF	Exposure Frequency	day/yr	32	BPJ (2)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	30	U.S. EPA 1989	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DAevent = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) Swimming is estimated to occur during a 2 hour time during boating within the Patapsco River.
(2) Swimming will 2 days per week during warmer months (June to September).

TABLE 6.4.2
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day)=
	CR	Ingestion Rate	L/day	0.01	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	32	BPJ (3)	(4)
	ED	Exposure Duration	yr	10	U.S. EPA 1997b	
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging time-Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	13,350	U.S. EPA 1997b (1)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (2)	For organic compounds
	EF	Exposure Frequency	day/yr	32	BPJ (3)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	10	U.S. EPA 1997b	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	(4)
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DAevent = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) The surface body area is averaged for two age ranges: 12 to 16 years and 6 to 11 years.
(2) Swimming is estimated to occur during a 2 hour time during boating within the Patapsco River.
(3) Swimming will 2 days per week during warmer months (June to September).
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.3
VALUES USED FOR CHILD RECREATIONAL USER DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child - Swimming

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CW	Concentration in Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	L/day	0.01	ATSDR 2003	CW x CR x ET x EF X ED / (BW X AT)
	EF	Exposure Frequency	day/yr	32	BPJ (2)	(4)
	ED	Exposure Duration	yr	3	BPJ (3)	
	BW	Body Weight	kg	18	U.S. EPA 1989	
	AT-NC	Averaging time-Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	6,600	U.S. EPA 2004	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	2	BPJ (1)	For organic compounds
	EF	Exposure Frequency	day/yr	32	BPJ (2)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	3	BPJ (3)	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging Time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	(4)
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DAevent = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) Swimming is estimated to occur during a 2 hour time during boating within the Patapsco River.
(2) Swimming will 2 days per week during warmer months (June to September).
(3) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not swim in the Patapsco River.
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.4
VALUES USED FOR WATERMAN DAILY SURFACE WATER INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult - Fishing

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CW	Concentration in Surface Water	mg/L	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2	3,900	U.S. EPA 1997b (1)	CW x SA x PC x ET x EF x ED x CF / (BW x AT)
	PC	Permeability Coefficient	cm/hr	Chemical-Specific	Chemical-Specific	
	ET	Exposure Time	hr/day	8	BPJ (2)	For organic compounds
	EF	Exposure Frequency	day/yr	39	BPJ (3)	CDI (mg/kg/day) =
	ED	Exposure Duration	yr	30	U.S. EPA 1989	DA_{event} x SA x EF x ED / (BW x AT)
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	L/cm^3	0.001	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
DAevent = Dermal Absorbed Dose per event, Example calculated in Appendix F
(1) The watermen contact would be limited to the hands and forearms arms since contact to surface water is primarily while hauling fishing nets into boat. The arm SA at 2,910 cm^2 and hands at 990 cm^2. This results in an SA of 3,900 cm^2.
(2) Watermen are expected to contact the water 8 hours/day while fishing.
(3) Fishing is expected to occur March through November, for a total of 9 months or 39 weeks. It is expected that a watermen would not fish exclusively in the Patapsco River near the Coke Point offshore environment. The watermen fishes near Coke Point 1 day/week for a total of 39 days/year.

TABLE 6.4.5
VALUES USED FOR ADULT RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,870	BPJ (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.07	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	32	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) Contact with sediment will be with the feet and lower legs. For the adult, the lower legs are 2,560 cm^2 and the feet are 1,310 cm^2, with a total of 3,870 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for resident adult exposure to soil.
(3) Swimming will 2 days per week during warmer months (June to September).

TABLE 6.4.6
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,870	U.S. EPA 1997b (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	(4)
	EF	Exposure Frequency	event/yr	32	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	10	BPJ	
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) Contact with sediment will be with the feet and lower legs. For the adolescent, the surface area for the adult lower legs are 2,560 cm^2 and the feet are 1,310 cm^2, with a total of 3,870 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for resident child exposure to soil.
(3) Swimming will 2 days per week during warmer months (June to September).
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.7
VALUES USED FOR CHILD RECREATIONAL USER DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	2,620	U.S. EPA 2008(1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	(5)
	EF	Exposure Frequency	event/yr	32	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	3	BPJ (4)	
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging Time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake

(1) Contact with sediment will be with the feet and lower legs. For the child, the surface area for the the legs are 2,070 cm^2 and the feet are 550 cm^2, for a total of 2,620 cm^2 (3 to 6 year age range).
(2) The adherence factor is conservatively equal to the recommended factor for resident child exposure to soil.
(3) Swimming will 2 days per week during warmer months (June to September).
(4) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not swim in the Patapsco River.
(5) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.8
VALUES USED FOR WATERMAN DAILY SEDIMENT INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Dermal	CS	Chemical Concentration in Sediment	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	SA	Surface Area for Contact	cm^2/event	3,900	U.S. EPA 1997b (1)	CS x SA x AF x ABS x EF x ED x CF / (BW x AT)
	AF	Adherence Factor	mg/cm^2	0.2	U.S. EPA 2004 & 2003a (2)	
	ABS	Dermal Absorption Fraction	Unitless	Chemical-Specific	U.S. EPA 2004	
	EF	Exposure Frequency	event/yr	39	BPJ (3)	
	ED-C	Exposure Duration - Cancer	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging Time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	
	CF	Conversion Factor	kg/mg	1.0E-06	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The watermen contact would be limited to the hands and forearms arms since contact to sediment is primarily while hauling fishing nets into boat. The arm SA at 2,910 cm^2 and hands at 990 cm^2. This results in an SA of 3,900 cm^2.
(2) The adherence factor is conservatively equal to the recommended factor for commercial/industrial worker exposure to soil.
(3) Fishing is expected to occur March through November, for a total of 9 months or 39 weeks. It is expected that a watermen would not fish exclusively in the Patapsco River near the Coke Point offshore environment. The watermen fishes near Coke Point 1 day/week for a total of 39 days/year.

TABLE 6.4.9
VALUES USED FOR ADULT RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.23	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	30	U.S. EPA 1989	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adult is 8 ounces/meal or 0.23 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs and consume their catch from the area for 2 days per week during warmer months, June to September (32 days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area

TABLE 6.4.10
VALUES USED FOR ADOLESCENT RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.17	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	10	BPJ	(3)
	BW	Body Weight	kg	45	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	3,650	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adolescent is 6 ounces/meal or 0.17 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs and consume their catch from the area for 2 days per week during warmer months, June to September (32 days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area
(3) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.11
VALUES USED FOR CHILD RECREATIONAL USER DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.085	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	32	BPJ (2)	
	ED	Exposure Duration	yr	3	BPJ (3)	(4)
	BW	Body Weight	kg	18	U.S. EPA 2008	
	AT-NC	Averaging time - Noncancer	days	1,095	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by a child is 3 ounces/meal or 0.085 kg/meal (wet weight).
(2) It is assumed that the recreational user will fish or catch crabs and consume their catch from the area for 2 days per week during warmer months, June to September (32 days). Fish and crab ingestion are each assumed at 16 meals/yr from the Coke Point Offshore Area
(3) Age range for child is assumed from 3 to 6 years. It is expected that children younger then 3 years will not eat catch from the Patapsco River.
(4) Slope Factor for chemicals identified as mutagenic in Table 5.6 are adjusted by a factor of 3.

TABLE 6.4.12
VALUES USED FOR WATERMAN DAILY FINFISH/CRAB INTAKE EQUATIONS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Medium: Surface Water/Sediment
Exposure Medium: Fish/Crab
Exposure Point: Coke Point
Receptor Population: Waterman
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	Intake Equation / Model Name
Ingestion	CS	Chemical Concentration in Fish Tissue/Crab Meat	mg/kg	Chemical-Specific	Chemical-Specific	CDI (mg/kg/day) =
	CR	Ingestion Rate	kg/meal	0.23	U.S. EPA 1997b, MDE 2007 (1)	CS x CR x EF x ED / (BW x AT)
	EF	Exposure Frequency	meals/yr	39	BPJ (2)	
	ED	Exposure Duration	yr	30	BPJ	
	BW	Body Weight	kg	70	U.S. EPA 1997b	
	AT-NC	Averaging time - Noncancer	days	10,950	U.S. EPA 1989	
	AT-C	Averaging Time - Cancer	days	25,550	U.S. EPA 1989	

Note : BPJ = Best Professional Judgement
CDI = chronic daily intake
(1) The weight of cooked fish ingested by an adult is 8 ounces/meal or 0.23 kg/meal (wet weight).
(2) It is assumed that the watermen will fish or catch crabs and consume their catch from the Patapsco River each day they visit the area (39 days). Fish and crab ingestion are each assumed at 19.5 meals/yr from the Coke Point Offshore Area

TABLE 6.5.1
NON-CANCER TOXICITY DATA - ORAL/DERMAL
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
DIOXIN/FURANS								
DIOXIN (TEQ)	Chronic	1.00E-09	1	1.00E-09	Developmental	90/1	ATSDR	12/1/2009
METALS								
ARSENIC	Chronic	3.00E-04	1	3.00E-04	Skin	3/1	IRIS	5/6/2010
COBALT	Chronic	3.00E-04	1	3.00E-04	Blood	10/1	PPTRV	7/20/2007
IRON	Chronic	7.00E-01	1	7.00E-01	None	NA/NA	PPRTV	9/11/2006
MANGANESE	Chronic	4.67E-02	0.04	1.87E-03	Central Nervous System	1/3	IRIS	5/6/2010
MERCURY	Chronic	1.00E-04	1	1.00E-04	Central Nervous System	10/1	IRIS	5/6/2010
SELENIUM	Chronic	5.00E-03	1	5.00E-03	Hair and Skin	3/1	IRIS	5/6/2010
VANADIUM	Chronic	5.00E-03	0.026	1.30E-04	Hair	100/1	PPRTV	9/20/2009
PAHS								
BENZO(A)ANTHRACENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(B)FLUORANTHENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(K)FLUORANTHENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
BENZO(A)PYRENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
CHRYSENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
DIBENZ(A,H)ANTHRACENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
FLUORANTHENE	Chronic	4.00E-02	1	4.00E-02	Liver	3000/1	IRIS	5/6/2010
INDENO(1,2,3-C,D)PYRENE	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
1-METHYLNAPHTHALENE	Chronic	7.00E-02	1	7.00E-02	Respiratory System	1000/1	ATSDR	8/1/2007
NAPHTHALENE	Chronic	2.00E-02	1	2.00E-02	Developmental System	3000/1	IRIS	5/6/2010
PYRENE	Chronic	3.00E-02	1	3.00E-02	Kidneys	3000/1	IRIS	5/6/2010
PCB CONGENERS								
TOTAL PCB's	NA	NA	1	NA	NA	NA/NA	IRIS	5/6/2010
VOLATILES								
BENZENE	Chronic	4.00E-03	1	4.00E-03	Liver	300/1	IRIS	5/6/2010

NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). RfDs are multiplied by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Effects Assessment Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.
PPRTV - Provisional Peer-Reviewed Toxicity Value. For PPRTV values, the date of the issue paper is provided.
CalEPA - Calfornia Environmental Protection Agency. For CalEPA values, the date searched is provided.
ATSDR - Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL).

TABLE 6.5.2
CHEMICAL-SPECIFIC PARAMETERS
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Absorption Factor	Reference	GI ABS	Reference	Permeability Constant (cm/hr)	Reference
Dioxin/Furans						
DIOXIN (TEQ)	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	8.10E-01	U.S. EPA 2004
Inorganics						
ARSENIC	0.03	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
COBALT	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	4.00E-04	U.S. EPA 2004
IRON	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
MANGANESE	0.01	U.S. EPA, 2003c	0.04	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
MERCURY	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
SELENIUM	0.01	U.S. EPA, 2003c	1	U.S. EPA, 2004	9.03E-04	U.S. EPA 2004
VANADIUM	0.01	U.S. EPA, 2003c	0.026	U.S. EPA, 2004	1.00E-03	U.S. EPA 2004
PAHs						
BENZ(A)ANTHRACENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-01	U.S. EPA 2004
BENZO(B)FLUORANTHENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	7.00E-01	U.S. EPA 2004
BENZO(K)FLUORANTHENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	6.91E-01	On-line Database(1)
BENZO(A)PYRENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	7.00E-01	U.S. EPA 2004
CHRYSENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-01	U.S. EPA 2004
DIBENZ(A,H)ANTHRACENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	1.50E+00	U.S. EPA 2004
FLUORANTHENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	2.20E-01	U.S. EPA 2004
INDENO(1,2,3-C,D)PYRENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	1.00E+00	U.S. EPA 2004
1-METHYLNAPHTHALENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	9.31E-02	On-line Database(1)
NAPHTHALENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	4.70E-02	U.S. EPA 2004
PYRENE	0.13	U.S. EPA, 2004	1	U.S. EPA, 2004	2.01E-01	On-line Database(1)
Pesticides/PCBs						
TOTAL PCB's	0.14	U.S. EPA, 2004	1	U.S. EPA, 2004	4.30E-01	U.S. EPA 2004
Volatiles						
BENZENE	0.0005	U.S. EPA, 2003c	1	U.S. EPA, 2004	1.50E-02	U.S. EPA 2004

NA = Data not available.
GI ABS = Gastrointestional Absorption factors
(1) Toxicity and Chemical-Specific Factors Database. Http://risk.lsd.ornl.gov/cgi-bin/tox. May 2010.
U.S. EPA, 2004 = U.S. Environmental Protection Agency, 2004. *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Final Guidance.
U.S. EPA, 2003c = U.S. Environmental Protection Agency, 2003. Region 3 Updated Dermal Exposure Assessment Guidance. Mid-Atlantic Risk Assessment. June. Available at: http://www.epa.gov/reg3hwmd/risk/human/info/dermalag.htm.

TABLE 6.6
CANCER TOXICITY DATA - ORAL/DERMAL
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral Absorption Efficiency for Dermal (GI ABS)(1)	Absorbed Cancer Slope Factor for Dermal (2)	Units	Weight of Evidence/Cancer Guideline Description	Mutagenic Compound	Source	Date (3) (mm/dd/yy)
Dioxin/Furans								
DIOXIN (TEQ)	1.30E+05	1	1.50E+05	per (mg/kg-day)	B2		CalEPA	5/1/2009
Inorganics								
ARSENIC	1.50E+00	1	1.50E+00	per (mg/kg-day)	A		IRIS	5/6/2010
COBALT	NA	1	NA	per (mg/kg-day)	NA		PPTRV	7/20/2007
IRON	NA	1	NA	per (mg/kg-day)	NA		EPA-NCEA	7/23/1996
MANGANESE	NA	0.04	NA	per (mg/kg-day)	D		IRIS	5/6/2010
MERCURY	NA	1	NA	per (mg/kg-day)	C		IRIS	5/6/2010
SELENIUM	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
VANADIUM	NA	0.026	NA	per (mg/kg-day)	NA		IRIS	5/6/2010
PAHs								
BENZ(A)ANTHRACENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(B)FLUORANTHENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(K)FLUORANTHENE	7.30E-02	1	7.30E-02	per (mg/kg-day)	B2	M	IRIS	5/6/2010
BENZO(A)PYRENE	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	M	IRIS	5/6/2010
CHRYSENE	7.30E-03	1	7.30E-03	per (mg/kg-day)	B2	M	IRIS	5/6/2010
DIBENZ(A,H)ANTHRACENE	7.30E+00	1	7.30E+00	per (mg/kg-day)	B2	M	IRIS	5/6/2010
FLUORANTHENE	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
INDENO(1,2,3-C,D)PYRENE	7.30E-01	1	7.30E-01	per (mg/kg-day)	B2	M	IRIS	5/6/2010
1-METHYLNAPHTHALENE	2.90E-02	1	2.90E-02	per (mg/kg-day)	C		PPRTV	1/10/2008
NAPHTHALENE	NA	1	NA	per (mg/kg-day)	C		IRIS	5/6/2010
PYRENE	NA	1	NA	per (mg/kg-day)	D		IRIS	5/6/2010
Pesticides/PCBs								
TOTAL PCB's	2.00E+00	1	2.00E+00	per (mg/kg-day)	B2		IRIS	5/6/2010
Volatiles								
BENZENE	5.50E-02	1	5.50E-02	per (mg/kg-day)	A		IRIS	5/6/2010

M = Chemical has a mutagenic mode of action
NA = Not Applicable
(1) Taken from USEPA 2004 Guidance.
(2) Dermal Toxicological values adjusted from oral values using USEPA 2004 recommended chemical-specific gastrointestinal absorption factors (GI ABS). CSFs are divided by the GI ABS.
(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article is provided .
PPRTV - Provisional Peer-Reviewed Toxicity Value. For PPRTV values, the date of the issue paper is provided.
CalEPA - Calfornia Environmental Protection Agency.
NJDEP - New Jersey Department of Environmental Protection.

Weight of Evidence: A - Human carcinogen
B1 - Probable human carcinogen - indicate that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 6.7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	1.13E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.69E-08	2.64E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.64E-04
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	1.21E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.81E-07	2.81E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.38E-04
				COBALT	2.94E+01	(mg/kg)	4.27E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	9.96E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.32E-04
				IRON	7.64E+04	(mg/kg)	1.11E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.59E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.70E-04
				VANADIUM	1.16E+02	(mg/kg)	1.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.94E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	3.03E-03
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	2.58E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.88E-07	6.03E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	2.39E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.75E-07	5.58E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	2.37E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.73E-06	5.53E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.27E+01	(mg/kg)	2.40E-07	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.75E-09	5.59E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	4.64E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.39E-07	1.08E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	3.02E+01	(mg/kg)	5.71E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.33E-06	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.33E-05
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	1.32E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.61E-08	3.07E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	1.33E+00	(mg/kg)	2.51E-08	(mg/kg-day)	2.90E-02	per (mg/kg-day)	7.27E-10	5.85E-08	(mg/kg-day)	7.00E-02	(mg/kg-day)	8.36E-07
				NAPHTHALENE	2.15E+03	(mg/kg)	4.06E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.48E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.74E-03
				PYRENE	1.57E+01	(mg/kg)	2.97E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	6.92E-07	(mg/kg-day)	3.00E-02	(mg/kg-day)	2.31E-05
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	5.39E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.08E-08	1.26E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	5.74E-12	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.16E-13	1.34E-11	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.35E-09
			Exp. Route Total								**2.74E-06**					**9.73E-03**
		Exposure Point Total									**2.74E-06**					**9.73E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	3.76E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	4.88E-05	8.77E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	8.77E-01
				METALS												
				ARSENIC	1.50E-01	(mg/kg)	9.23E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.38E-05	2.15E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.18E-02
				COBALT	2.84E-01	(mg/kg)	1.75E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.09E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.36E-01
				IRON	3.54E+02	(mg/kg)	2.18E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	5.09E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	7.28E-02
				VANADIUM	6.29E+00	(mg/kg)	3.88E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.06E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.81E-01
				PAHS												
				BENZO(A)ANTHRACENE	2.04E+00	(mg/kg)	1.26E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.17E-05	2.93E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	6.00E-01	(mg/kg)	3.70E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.70E-05	8.64E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	9.17E-01	(mg/kg)	5.66E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.13E-04	1.32E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.84E+00	(mg/kg)	1.13E-04	(mg/kg-day)	7.30E-03	per (mg/kg-day)	8.28E-07	2.65E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.37E-01	(mg/kg)	2.70E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.97E-04	6.30E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	9.37E+00	(mg/kg)	5.78E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.35E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.37E-02
				INDENO(1,2,3-C,D)PYRENE	3.94E-01	(mg/kg)	2.43E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.78E-05	5.68E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	2.24E-01	(mg/kg)	1.38E-05	(mg/kg-day)	2.90E-02	per (mg/kg-day)	4.01E-07	3.23E-05	(mg/kg-day)	7.00E-02	(mg/kg-day)	4.61E-04
				NAPHTHALENE	3.76E+01	(mg/kg)	2.32E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	5.42E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.71E-01
				PYRENE	5.41E+00	(mg/kg)	3.34E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	7.79E-04	(mg/kg-day)	3.00E-02	(mg/kg-day)	2.60E-02
				PCB CONGENERS												
				TOTAL PCB's	1.83E+00	(mg/kg)	1.13E-04	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.26E-04	2.64E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	4.88E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.68E-07	1.14E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.84E-03
			Exp. Route Total								**1.04E-03**					**1.67E+00**
		Exposure Point Total									**1.04E-03**					**1.67E+00**
	Exposure Medium Total										**1.04E-03**					**1.68E+00**
Sediment Total											**1.04E-03**					**1.68E+00**

TABLE 6.7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	4.70E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.05E-08	1.10E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.66E-04
				MANGANESE	7.01E-02	(mg/L)	7.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	3.76E-05
				MERCURY	5.73E-05	(mg/L)	6.15E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.44E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.44E-05
				SELENIUM	1.35E-02	(mg/L)	1.45E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.37E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.75E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.05E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.68E-09	2.45E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	1.06E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.71E-09	2.46E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	1.10E-08	(mg/kg-day)	7.30E-02	per (mg/kg-day)	8.00E-10	2.56E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	8.15E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.95E-08	1.90E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.16E-08	(mg/kg-day)	7.30E-03	per (mg/kg-day)	8.50E-11	2.72E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.31E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.56E-08	3.06E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	1.24E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.06E-09	2.90E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	1.34E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.37E-09	3.13E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	7.82E-05
			Exp. Route Total								**2.58E-07**					**5.63E-04**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	8.46E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.27E-07	1.97E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.58E-04
				MANGANESE	7.01E-02	(mg/L)	1.35E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.16E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	1.69E-03
				MERCURY	5.73E-05	(mg/L)	1.11E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	2.58E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.58E-05
				SELENIUM	1.35E-02	(mg/L)	2.35E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.48E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.10E-04
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	2.46E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.79E-05	5.74E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	4.29E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.13E-05	1.00E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	4.45E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	3.25E-06	1.04E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	3.26E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.38E-04	7.61E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	2.72E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.99E-07	6.35E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	8.09E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.91E-04	1.89E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	5.04E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.68E-05	1.18E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	4.54E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.49E-07	1.06E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.65E-03
			Exp. Route Total								**9.19E-04**					**5.13E-03**
		Exposure Point Total									**9.19E-04**					**5.70E-03**
		Finfish	Ingestion	**METALS**												
				ARSENIC	1.75E-03	(mg/kg)	1.08E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.62E-07	2.52E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.41E-04
				MANGANESE	2.80E+01	(mg/kg)	1.73E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	4.04E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	8.65E-02
				MERCURY	1.03E-01	(mg/kg)	6.37E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.49E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.49E-01
				SELENIUM	3.26E+00	(mg/kg)	2.01E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.70E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	9.39E-02
				PAHS												
				BENZO(A)ANTHRACENE	5.71E-01	(mg/kg)	3.53E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.57E-05	8.23E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	5.74E-01	(mg/kg)	3.54E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.59E-05	8.26E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	5.95E-01	(mg/kg)	3.67E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	2.68E-06	8.57E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.42E-01	(mg/kg)	2.73E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.99E-04	6.37E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	6.33E-01	(mg/kg)	3.90E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	2.85E-07	9.11E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.11E-01	(mg/kg)	4.39E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.21E-04	1.02E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.74E-01	(mg/kg)	4.16E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.04E-05	9.71E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	9.09E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	5.00E-07	2.12E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	5.30E-03
			Exp. Route Total								**6.05E-04**					**3.35E-01**
		Exposure Point Total									**6.05E-04**					**3.35E-01**
	Exposure Medium Total										**1.52E-03**					**3.41E-01**
Surface Water Total											**1.52E-03**					**3.41E-01**
										Total of Receptor Risks Across All Media	**2.56E-03**				Total of Receptor Hazards Across All Media	**2.02E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 6.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	1.67E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	2.51E-08	1.17E-12	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.17E-03
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	1.79E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.68E-07	1.25E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.17E-03
				COBALT	2.94E+01	(mg/kg)	6.32E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.43E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.48E-03
				IRON	7.64E+04	(mg/kg)	1.65E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.15E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.65E-03
				VANADIUM	1.16E+02	(mg/kg)	2.50E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.75E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	1.35E-02
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	1.15E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.38E-07	2.68E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	1.06E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.76E-07	2.48E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	1.05E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.69E-06	2.46E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.27E+01	(mg/kg)	1.06E-06	(mg/kg-day)	7.30E-03	per (mg/kg-day)	7.77E-09	2.48E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	2.06E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.51E-06	4.82E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	3.02E+01	(mg/kg)	8.46E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.92E-06	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.48E-04
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	5.85E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.27E-07	1.37E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	1.33E+00	(mg/kg)	3.72E-08	(mg/kg-day)	2.90E-02	per (mg/kg-day)	1.08E-09	2.60E-07	(mg/kg-day)	7.00E-02	(mg/kg-day)	3.72E-06
				NAPHTHALENE	2.15E+03	(mg/kg)	6.02E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.21E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.11E-02
				PYRENE	1.57E+01	(mg/kg)	4.40E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.08E-06	(mg/kg-day)	3.00E-02	(mg/kg-day)	1.03E-04
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	7.99E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.60E-08	5.59E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	8.51E-12	(mg/kg-day)	5.50E-02	per (mg/kg-day)	4.68E-13	5.96E-11	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.49E-08
			Exp. Route Total								**1.16E-05**					**4.33E-02**
		Exposure Point Total									**1.16E-05**					**4.33E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	1.44E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.87E-05	1.01E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.01E+00
				METALS												
				ARSENIC	1.50E-01	(mg/kg)	3.54E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.31E-06	2.48E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.25E-02
				COBALT	2.84E-01	(mg/kg)	6.71E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	4.70E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.57E-01
				IRON	3.54E+02	(mg/kg)	8.37E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	5.86E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	8.37E-02
				VANADIUM	6.29E+00	(mg/kg)	1.49E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.04E-03	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.08E-01
				PAHS												
				BENZO(A)ANTHRACENE	2.04E+00	(mg/kg)	1.44E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.05E-04	3.37E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	6.00E-01	(mg/kg)	4.26E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.11E-05	9.94E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	9.17E-01	(mg/kg)	6.51E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.75E-04	1.52E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.84E+00	(mg/kg)	1.30E-04	(mg/kg-day)	7.30E-03	per (mg/kg-day)	9.52E-07	3.04E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.37E-01	(mg/kg)	3.10E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.27E-04	7.24E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	9.37E+00	(mg/kg)	2.22E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.55E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	3.88E-02
				INDENO(1,2,3-C,D)PYRENE	3.94E-01	(mg/kg)	2.80E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.04E-05	6.53E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	2.24E-01	(mg/kg)	5.31E-06	(mg/kg-day)	2.90E-02	per (mg/kg-day)	1.54E-07	3.71E-05	(mg/kg-day)	7.00E-02	(mg/kg-day)	5.31E-04
				NAPHTHALENE	3.76E+01	(mg/kg)	8.90E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	6.23E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.11E-01
				PYRENE	5.41E+00	(mg/kg)	1.28E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.95E-04	(mg/kg-day)	3.00E-02	(mg/kg-day)	2.98E-02
				PCB CONGENERS												
				TOTAL PCB's	1.83E+00	(mg/kg)	4.33E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	8.66E-05	3.03E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	1.87E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.03E-07	1.31E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.27E-03
			Exp. Route Total								**9.70E-04**					**1.92E+00**
		Exposure Point Total									**9.70E-04**					**1.92E+00**
	Exposure Medium Total										**9.82E-04**					**1.97E+00**
Sediment Total											**9.82E-04**					**1.97E+00**

TABLE 6.7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.22E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.83E-08	8.53E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.84E-04
				MANGANESE	7.01E-02	(mg/L)	1.95E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.37E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	2.93E-05
				MERCURY	5.73E-05	(mg/L)	1.59E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.12E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.12E-05
				SELENIUM	1.35E-02	(mg/L)	3.75E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.62E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.25E-05
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	8.18E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.97E-09	1.91E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	8.22E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.00E-09	1.92E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	8.52E-09	(mg/kg-day)	7.30E-02	per (mg/kg-day)	6.22E-10	1.99E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	6.34E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.63E-08	1.48E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	9.06E-09	(mg/kg-day)	7.30E-03	per (mg/kg-day)	6.61E-11	2.11E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	1.02E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.44E-08	2.38E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	9.65E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.05E-09	2.25E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	3.47E-08	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.91E-09	2.43E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.08E-05
			Exp. Route Total								**1.61E-07**					**4.38E-04**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	3.25E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.88E-08	2.28E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.59E-04
				MANGANESE	7.01E-02	(mg/L)	5.21E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.65E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	1.95E-03
				MERCURY	5.73E-05	(mg/L)	4.26E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.98E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.98E-05
				SELENIUM	1.35E-02	(mg/L)	9.04E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.33E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.27E-04
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	2.84E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.07E-05	6.62E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	4.95E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.61E-05	1.16E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	5.14E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	3.75E-06	1.20E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	3.76E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.75E-04	8.78E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	3.14E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	2.29E-07	7.33E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	9.34E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.82E-04	2.18E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	5.82E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.25E-05	1.36E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	1.74E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	9.59E-08	1.22E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.05E-03
			Exp. Route Total								**1.06E-03**					**5.92E-03**
		Exposure Point Total									**1.06E-03**					**6.36E-03**
		Finfish	Ingestion	**METALS**												
				ARSENIC	1.75E-03	(mg/kg)	4.14E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.22E-08	2.90E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.67E-04
				MANGANESE	2.80E+01	(mg/kg)	6.63E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.64E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	9.95E-02
				MERCURY	1.03E-01	(mg/kg)	2.44E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.71E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.71E-01
				SELENIUM	3.26E+00	(mg/kg)	7.71E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	5.40E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.08E-01
				PAHS												
				BENZO(A)ANTHRACENE	5.71E-01	(mg/kg)	4.05E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.96E-05	9.46E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	5.74E-01	(mg/kg)	4.07E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.97E-05	9.50E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	5.95E-01	(mg/kg)	4.22E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	3.08E-06	9.86E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.42E-01	(mg/kg)	3.14E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.29E-04	7.33E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	6.33E-01	(mg/kg)	4.49E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	3.28E-07	1.05E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.11E-01	(mg/kg)	5.05E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.69E-04	1.18E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.74E-01	(mg/kg)	4.78E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.49E-05	1.12E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	3.48E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.92E-07	2.44E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.10E-03
			Exp. Route Total								**6.96E-04**					**3.85E-01**
		Exposure Point Total									**6.96E-04**					**3.85E-01**
	Exposure Medium Total										**1.76E-03**					**3.92E-01**
Surface Water Total											**1.76E-03**					**3.92E-01**
										Total of Receptor Risks Across All Media	**2.74E-03**				Total of Receptor Hazards Across All Media	**2.36E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 6.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	8.50E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.27E-08	1.98E-12	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.98E-03
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	9.07E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.36E-07	2.12E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.05E-03
				COBALT	2.94E+01	(mg/kg)	3.21E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.49E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.50E-03
				IRON	7.64E+04	(mg/kg)	8.35E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.95E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.78E-03
				VANADIUM	1.16E+02	(mg/kg)	1.27E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.97E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	2.28E-02
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	5.83E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.25E-07	4.53E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	5.40E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.94E-07	4.20E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	5.35E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.91E-06	4.16E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.27E+01	(mg/kg)	5.40E-07	(mg/kg-day)	7.30E-03	per (mg/kg-day)	3.95E-09	4.20E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	1.05E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.65E-07	8.15E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	3.02E+01	(mg/kg)	4.30E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.00E-05	(mg/kg-day)	4.00E-02	(mg/kg-day)	2.51E-04
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	2.97E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.17E-07	2.31E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	1.33E+00	(mg/kg)	1.89E-08	(mg/kg-day)	2.90E-02	per (mg/kg-day)	5.47E-10	4.40E-07	(mg/kg-day)	7.00E-02	(mg/kg-day)	6.29E-06
				NAPHTHALENE	2.15E+03	(mg/kg)	3.06E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	7.13E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.57E-02
				PYRENE	1.57E+01	(mg/kg)	2.23E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.21E-06	(mg/kg-day)	3.00E-02	(mg/kg-day)	1.74E-04
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	4.06E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	8.12E-09	9.47E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	4.32E-12	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.38E-13	1.01E-10	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.52E-08
			Exp. Route Total								**5.87E-06**					**7.32E-02**
		Exposure Point Total									**5.87E-06**					**7.32E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	5.40E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	7.02E-06	1.26E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.26E+00
				METALS												
				ARSENIC	1.50E-01	(mg/kg)	1.33E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.99E-06	3.10E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.03E-01
				COBALT	2.84E-01	(mg/kg)	2.52E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.88E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.96E-01
				IRON	3.54E+02	(mg/kg)	3.14E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	7.32E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.05E-01
				VANADIUM	6.29E+00	(mg/kg)	5.58E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.30E-03	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.60E-01
				PAHS												
				BENZO(A)ANTHRACENE	2.04E+00	(mg/kg)	5.42E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.95E-05	4.21E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	6.00E-01	(mg/kg)	1.60E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.17E-05	1.24E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	9.17E-01	(mg/kg)	2.44E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.78E-04	1.90E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.84E+00	(mg/kg)	4.89E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	3.57E-07	3.80E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.37E-01	(mg/kg)	1.16E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.50E-05	9.05E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	9.37E+00	(mg/kg)	8.31E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.94E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.85E-02
				INDENO(1,2,3-C,D)PYRENE	3.94E-01	(mg/kg)	1.05E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.66E-06	8.16E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	2.24E-01	(mg/kg)	1.99E-06	(mg/kg-day)	2.90E-02	per (mg/kg-day)	5.77E-08	4.64E-05	(mg/kg-day)	7.00E-02	(mg/kg-day)	6.63E-04
				NAPHTHALENE	3.76E+01	(mg/kg)	3.34E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	7.78E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.89E-01
				PYRENE	5.41E+00	(mg/kg)	4.80E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.12E-03	(mg/kg-day)	3.00E-02	(mg/kg-day)	3.73E-02
				PCB CONGENERS												
				TOTAL PCB's	1.83E+00	(mg/kg)	1.62E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.25E-05	3.79E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	7.01E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.85E-08	1.64E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.09E-03
			Exp. Route Total								**3.64E-04**					**2.40E+00**
		Exposure Point Total									**3.64E-04**					**2.40E+00**
	Exposure Medium Total										**3.70E-04**					**2.48E+00**
Sediment Total											**3.70E-04**					**2.48E+00**

TABLE 6.7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Ingestion	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	9.14E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.37E-08	2.13E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.11E-04
				MANGANESE	7.01E-02	(mg/L)	1.46E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.41E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	7.32E-05
				MERCURY	5.73E-05	(mg/L)	1.20E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.79E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.79E-05
				SELENIUM	1.35E-02	(mg/L)	2.81E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.56E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.31E-04
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	6.14E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.48E-09	4.77E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	6.16E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.50E-09	4.79E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	6.39E-09	(mg/kg-day)	7.30E-02	per (mg/kg-day)	4.67E-10	4.97E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	4.75E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.47E-08	3.70E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	6.79E-09	(mg/kg-day)	7.30E-03	per (mg/kg-day)	4.96E-11	5.28E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	7.64E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.58E-08	5.94E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	7.24E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.28E-09	5.63E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	2.61E-08	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.43E-09	6.08E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.52E-04
			Exp. Route Total								**1.20E-07**					**1.10E-03**
			Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	1.21E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.81E-08	2.82E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.39E-04
				MANGANESE	7.01E-02	(mg/L)	1.93E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.51E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	2.41E-03
				MERCURY	5.73E-05	(mg/L)	1.58E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	3.68E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	3.68E-05
				SELENIUM	1.35E-02	(mg/L)	3.35E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.82E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.56E-04
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.05E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.68E-06	8.18E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	1.84E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.34E-05	1.43E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	1.90E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.39E-06	1.48E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	1.40E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.02E-04	1.09E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.16E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	8.50E-08	9.05E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	3.46E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.53E-04	2.69E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	2.16E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.58E-05	1.68E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	6.47E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.56E-08	1.51E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.77E-03
			Exp. Route Total								**3.93E-04**					**7.32E-03**
		Exposure Point Total									**3.93E-04**					**8.41E-03**
		Finfish	Ingestion	**METALS**												
				ARSENIC	1.75E-03	(mg/kg)	1.55E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.33E-08	3.63E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.21E-03
				MANGANESE	2.80E+01	(mg/kg)	2.49E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.80E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.24E-01
				MERCURY	1.03E-01	(mg/kg)	9.15E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.14E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.14E-01
				SELENIUM	3.26E+00	(mg/kg)	2.89E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	6.75E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.35E-01
				PAHS												
				BENZO(A)ANTHRACENE	5.71E-01	(mg/kg)	1.52E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.11E-05	1.18E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	5.74E-01	(mg/kg)	1.53E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.11E-05	1.19E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	5.95E-01	(mg/kg)	1.58E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.16E-06	1.23E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.42E-01	(mg/kg)	1.18E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.60E-05	9.16E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	6.33E-01	(mg/kg)	1.68E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.23E-07	1.31E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.11E-01	(mg/kg)	1.89E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.38E-04	1.47E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.74E-01	(mg/kg)	1.79E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.31E-05	1.40E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	1.31E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.19E-08	3.05E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	7.62E-03
			Exp. Route Total								**2.61E-04**					**4.82E-01**
		Exposure Point Total									**2.61E-04**					**4.82E-01**
	Exposure Medium Total										**6.54E-04**					**4.90E-01**
Surface Water Total											**6.54E-04**					**4.90E-01**
										Total of Receptor Risks Across All Media	**1.02E-03**				Total of Receptor Hazards Across All Media	**2.97E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 6.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Coke Point	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-05	(mg/kg)	3.96E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	5.95E-08	9.25E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	9.25E-04
				METALS												
				ARSENIC	2.76E+01	(mg/kg)	4.23E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.35E-07	9.87E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.29E-03
				COBALT	2.94E+01	(mg/kg)	1.50E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.49E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.16E-03
				IRON	7.64E+04	(mg/kg)	3.90E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.09E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.30E-03
				VANADIUM	1.16E+02	(mg/kg)	5.93E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.38E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	1.06E-02
				PAHS												
				BENZO(A)ANTHRACENE	1.37E+01	(mg/kg)	9.06E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.61E-07	2.11E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.27E+01	(mg/kg)	8.40E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.13E-07	1.96E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.25E+01	(mg/kg)	8.32E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.07E-06	1.94E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.27E+01	(mg/kg)	8.40E-07	(mg/kg-day)	7.30E-03	per (mg/kg-day)	6.14E-09	1.96E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.46E+00	(mg/kg)	1.63E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.19E-06	3.80E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	3.02E+01	(mg/kg)	2.00E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	4.68E-06	(mg/kg-day)	4.00E-02	(mg/kg-day)	1.17E-04
				INDENO(1,2,3-C,D)PYRENE	6.97E+00	(mg/kg)	4.62E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.37E-07	1.08E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	1.33E+00	(mg/kg)	8.80E-08	(mg/kg-day)	2.90E-02	per (mg/kg-day)	2.55E-09	2.05E-07	(mg/kg-day)	7.00E-02	(mg/kg-day)	2.93E-06
				NAPHTHALENE	2.15E+03	(mg/kg)	1.43E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.33E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	1.66E-02
				PYRENE	1.57E+01	(mg/kg)	1.04E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.43E-06	(mg/kg-day)	3.00E-02	(mg/kg-day)	8.10E-05
				PCB CONGENERS												
				TOTAL PCB's	2.65E-01	(mg/kg)	1.89E-08	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.79E-08	4.42E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	2.02E-11	(mg/kg-day)	5.50E-02	per (mg/kg-day)	1.11E-12	4.70E-11	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.18E-08
			Exp. Route Total								**9.61E-06**					**3.42E-02**
		Exposure Point Total									**9.61E-06**					**3.42E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.09E-06	(mg/kg)	4.58E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	5.95E-05	1.07E-09	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.07E+00
				METALS												
				ARSENIC	1.50E-01	(mg/kg)	1.12E-05	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.69E-05	2.62E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.75E-02
				COBALT	2.84E-01	(mg/kg)	2.14E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.98E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.66E-01
				IRON	3.54E+02	(mg/kg)	2.66E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	6.21E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	8.87E-02
				VANADIUM	6.29E+00	(mg/kg)	4.73E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.10E-03	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.21E-01
				PAHS												
				BENZO(A)ANTHRACENE	2.04E+00	(mg/kg)	1.53E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.12E-04	3.57E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	6.00E-01	(mg/kg)	4.51E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.30E-05	1.05E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	9.17E-01	(mg/kg)	6.90E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.03E-04	1.61E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.84E+00	(mg/kg)	1.38E-04	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.01E-06	3.22E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.37E-01	(mg/kg)	3.29E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.40E-04	7.68E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				FLUORANTHENE	9.37E+00	(mg/kg)	7.05E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.64E-03	(mg/kg-day)	4.00E-02	(mg/kg-day)	4.11E-02
				INDENO(1,2,3-C,D)PYRENE	3.94E-01	(mg/kg)	2.97E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.17E-05	6.92E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				1-METHYLNAPHTHALENE	2.24E-01	(mg/kg)	1.69E-05	(mg/kg-day)	2.90E-02	per (mg/kg-day)	4.89E-07	3.94E-05	(mg/kg-day)	7.00E-02	(mg/kg-day)	5.62E-04
				NAPHTHALENE	3.76E+01	(mg/kg)	2.83E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	6.60E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	3.30E-01
				PYRENE	5.41E+00	(mg/kg)	4.07E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.49E-04	(mg/kg-day)	3.00E-02	(mg/kg-day)	3.16E-02
				PCB CONGENERS												
				TOTAL PCB's	1.83E+00	(mg/kg)	1.38E-04	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.75E-04	3.21E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	7.90E-02	(mg/kg)	5.94E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.27E-07	1.39E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.47E-03
			Exp. Route Total								**1.26E-03**					**2.04E+00**
		Exposure Point Total									**1.26E-03**					**2.04E+00**
	Exposure Medium Total										**1.27E-03**					**2.07E+00**
Sediment Total											**1.27E-03**					**2.07E+00**

TABLE 6.7.4
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coke Point	Dermal	**METALS**												
				ARSENIC	4.38E-03	(mg/L)	8.94E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.34E-07	2.09E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.95E-04
				MANGANESE	7.01E-02	(mg/L)	1.43E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.34E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	1.79E-03
				MERCURY	5.73E-05	(mg/L)	1.17E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	2.73E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.73E-05
				SELENIUM	1.35E-02	(mg/L)	2.48E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.79E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.16E-04
				PAHS												
				BENZO(A)ANTHRACENE	9.80E-04	(mg/L)	1.30E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.48E-06	3.03E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.84E-04	(mg/L)	2.27E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.65E-05	5.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	1.02E-03	(mg/L)	2.35E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.72E-06	5.49E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	7.59E-04	(mg/L)	1.72E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.26E-04	4.02E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	1.09E-03	(mg/L)	1.44E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	1.05E-07	3.35E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.22E-03	(mg/L)	4.27E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.12E-04	9.97E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.16E-03	(mg/L)	2.66E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.94E-05	6.22E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.25E-02	(mg/L)	3.92E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.16E-07	9.16E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.29E-03
			Exp. Route Total								**4.85E-04**					**4.92E-03**
		Exposure Point Total									**4.85E-04**					**4.92E-03**
		Finfish	Ingestion	**METALS**												
				ARSENIC	1.75E-03	(mg/kg)	1.32E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.98E-07	3.08E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.03E-03
				MANGANESE	2.80E+01	(mg/kg)	2.11E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	4.92E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.05E-01
				MERCURY	1.03E-01	(mg/kg)	7.76E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.81E-01
				SELENIUM	3.26E+00	(mg/kg)	2.45E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.72E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.14E-01
				PAHS												
				BENZO(A)ANTHRACENE	5.71E-01	(mg/kg)	4.30E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.14E-05	1.00E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	5.74E-01	(mg/kg)	4.32E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.15E-05	1.01E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	5.95E-01	(mg/kg)	4.48E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	3.27E-06	1.04E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	4.42E-01	(mg/kg)	3.33E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.43E-04	7.77E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				CHRYSENE	6.33E-01	(mg/kg)	4.76E-05	(mg/kg-day)	7.30E-03	per (mg/kg-day)	3.47E-07	1.11E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.11E-01	(mg/kg)	5.35E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.91E-04	1.25E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	6.74E-01	(mg/kg)	5.07E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.70E-05	1.18E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				VOLATILES												
				BENZENE	1.47E-01	(mg/kg)	1.11E-05	(mg/kg-day)	5.50E-02	per (mg/kg-day)	6.09E-07	2.59E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	6.46E-03
			Exp. Route Total								**7.38E-04**					**4.08E-01**
		Exposure Point Total									**7.38E-04**					**4.08E-01**
	Exposure Medium Total										**1.22E-03**					**4.13E-01**
Surface Water Total											**1.22E-03**					**4.13E-01**
										Total of Receptor Risks Across All Media	**2.50E-03**				Total of Receptor Hazards Across All Media	**2.49E+00**

Note:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal Intake is "NA" due to no reccomended Dermal Absorption Fractions (ABS) for this chemical. Please See table 6.5.2.

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	3.56E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	5.34E-09	8.31E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	8.31E-05
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	4.67E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.01E-08	1.09E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.63E-04
				COBALT	1.98E+01	(mg/kg)	2.88E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.72E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.24E-04
				IRON	2.74E+04	(mg/kg)	3.99E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.30E-05	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.33E-04
				VANADIUM	9.44E+01	(mg/kg)	1.37E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.20E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	2.46E-03
				PAHS												
				BENZO(A)ANTHRACENE	1.20E+00	(mg/kg)	2.27E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.66E-08	5.29E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.90E+00	(mg/kg)	3.59E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.62E-08	8.38E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	2.08E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.52E-07	4.85E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.49E-01	(mg/kg)	2.82E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.06E-08	6.57E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.70E-01	(mg/kg)	1.64E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.20E-08	3.84E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	1.08E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.17E-09	2.53E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.05E-07**					**3.27E-03**
		Exposure Point Total									**3.05E-07**					**3.27E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	1.92E-06	(mg/kg)	1.19E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.54E-05	2.77E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.77E-01
				METALS												
				ARSENIC	5.79E-02	(mg/kg)	3.57E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.36E-06	8.34E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.78E-02
				COBALT	1.91E-01	(mg/kg)	1.18E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.75E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.17E-02
				IRON	1.27E+02	(mg/kg)	7.84E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.83E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.61E-02
				VANADIUM	5.11E+00	(mg/kg)	3.15E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	7.36E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.47E-01
				PAHS												
				BENZO(A)ANTHRACENE	1.79E-01	(mg/kg)	1.10E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.07E-06	2.58E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.00E-02	(mg/kg)	5.56E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.06E-06	1.30E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	8.04E-02	(mg/kg)	4.96E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.62E-05	1.16E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.65E-02	(mg/kg)	1.64E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.19E-05	3.82E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.92E-02	(mg/kg)	3.04E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.22E-06	7.09E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	3.67E-01	(mg/kg)	2.27E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.53E-05	5.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.29E-04**					**5.69E-01**
		Exposure Point Total									**1.29E-04**					**5.69E-01**
	Exposure Medium Total										**1.29E-04**					**5.73E-01**
Sediment Total											**1.29E-04**					**5.73E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	5.03E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.55E-08	1.17E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.91E-04
				MANGANESE	8.14E-02	(mg/L)	8.74E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.04E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	4.37E-05
				MERCURY	3.90E-05	(mg/L)	4.19E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	9.77E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.77E-06
				SELENIUM	1.26E-02	(mg/L)	1.35E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.15E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.30E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.50E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.10E-09	3.51E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	5.26E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.84E-10	1.23E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	5.47E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.00E-09	1.28E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	7.84E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.72E-09	1.83E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	7.84E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.72E-10	1.83E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.72E-08**					**5.08E-04**
			Dermal	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	9.06E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.36E-07	2.11E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.04E-04
				MANGANESE	8.14E-02	(mg/L)	1.57E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.67E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	1.97E-03
				MERCURY	3.90E-05	(mg/L)	7.54E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.76E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.76E-05
				SELENIUM	1.26E-02	(mg/L)	2.19E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.12E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.02E-04
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	3.51E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.56E-06	8.19E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	2.14E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.56E-06	4.99E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	2.19E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.60E-05	5.11E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	4.84E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.54E-05	1.13E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	3.19E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.33E-06	7.43E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.79E-05**					**2.79E-03**
		Exposure Point Total									**5.80E-05**					**3.30E-03**

TABLE 6.7.5
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.87E-03	(mg/kg)	1.16E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.74E-07	2.70E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.00E-04
				MANGANESE	3.26E+01	(mg/kg)	2.01E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	4.69E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.01E-01
				MERCURY	7.02E-02	(mg/kg)	4.33E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.01E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.01E-01
				SELENIUM	3.04E+00	(mg/kg)	1.88E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.38E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.76E-02
				PAHS												
				BENZO(A)ANTHRACENE	8.16E-02	(mg/kg)	5.04E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.68E-06	1.18E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	2.86E-02	(mg/kg)	1.76E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.29E-06	4.11E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	2.97E-02	(mg/kg)	1.84E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.34E-05	4.28E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.26E-02	(mg/kg)	2.63E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.92E-05	6.13E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.26E-02	(mg/kg)	2.63E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.92E-06	6.13E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.96E-05**					**2.90E-01**
		Exposure Point Total									**3.96E-05**					**2.90E-01**
	Exposure Medium Total										**9.77E-05**					**2.93E-01**
Surface Water Total											**9.77E-05**					**2.93E-01**
										Total of Receptor Risks Across All Media	**2.27E-04**				Total of Receptor Hazards Across All Media	**8.66E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 6.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	5.28E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	7.92E-09	3.69E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	3.69E-04
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	6.92E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.04E-07	4.85E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.62E-03
				COBALT	1.98E+01	(mg/kg)	4.27E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.99E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.95E-04
				IRON	2.74E+04	(mg/kg)	5.91E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.13E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	5.91E-04
				VANADIUM	9.44E+01	(mg/kg)	2.03E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.42E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	1.10E-02
				PAHS												
				BENZO(A)ANTHRACENE	1.20E+00	(mg/kg)	1.01E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.36E-08	2.35E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.90E+00	(mg/kg)	1.60E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.17E-07	3.72E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	9.24E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.75E-07	2.16E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.49E-01	(mg/kg)	1.25E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.14E-08	2.92E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.70E-01	(mg/kg)	7.31E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.34E-08	1.71E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	1.60E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.21E-09	1.12E-08	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.12E-06**					**1.45E-02**
		Exposure Point Total									**1.12E-06**					**1.45E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	1.92E-06	(mg/kg)	4.54E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	5.90E-06	3.18E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	3.18E-01
				METALS												
				ARSENIC	5.79E-02	(mg/kg)	1.37E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.05E-06	9.59E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.20E-02
				COBALT	1.91E-01	(mg/kg)	4.52E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.16E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.05E-01
				IRON	1.27E+02	(mg/kg)	3.00E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.10E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.00E-02
				VANADIUM	5.11E+00	(mg/kg)	1.21E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.46E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.69E-01
				PAHS												
				BENZO(A)ANTHRACENE	1.79E-01	(mg/kg)	1.27E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.27E-06	2.96E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.00E-02	(mg/kg)	6.39E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.66E-06	1.49E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	8.04E-02	(mg/kg)	5.71E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.17E-05	1.33E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.65E-02	(mg/kg)	1.88E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.37E-05	4.39E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.92E-02	(mg/kg)	3.49E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.55E-06	8.15E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	3.67E-01	(mg/kg)	8.68E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.74E-05	6.08E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**9.72E-05**					**6.55E-01**
		Exposure Point Total									**9.72E-05**					**6.55E-01**
	Exposure Medium Total										**9.83E-05**					**6.69E-01**
Sediment Total											**9.83E-05**					**6.69E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	1.30E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.96E-08	9.13E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.04E-04
				MANGANESE	8.14E-02	(mg/L)	2.27E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	3.40E-05
				MERCURY	3.90E-05	(mg/L)	1.09E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	7.60E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.60E-06
				SELENIUM	1.26E-02	(mg/L)	3.50E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.45E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.90E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.17E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.53E-10	2.73E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	4.09E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.99E-10	9.55E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	4.26E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.11E-09	9.94E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	6.10E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.45E-09	1.42E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	6.10E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.45E-10	1.42E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**2.87E-08**					**3.95E-04**
			Dermal	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	3.48E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.22E-08	2.44E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.13E-04
				MANGANESE	8.14E-02	(mg/L)	6.05E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.24E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	2.27E-03
				MERCURY	3.90E-05	(mg/L)	2.90E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.03E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.03E-05
				SELENIUM	1.26E-02	(mg/L)	8.43E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.90E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.18E-04
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	4.05E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.96E-06	9.45E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	2.47E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.80E-06	5.75E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	2.53E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.85E-05	5.90E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	5.59E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.08E-05	1.30E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	3.67E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.68E-06	8.57E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**6.67E-05**					**3.22E-03**
		Exposure Point Total									**6.68E-05**					**3.62E-03**

TABLE 6.7.6
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.87E-03	(mg/kg)	4.44E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.65E-08	3.10E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.03E-03
				MANGANESE	3.26E+01	(mg/kg)	7.71E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.39E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.16E-01
				MERCURY	7.02E-02	(mg/kg)	1.66E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.16E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.16E-01
				SELENIUM	3.04E+00	(mg/kg)	7.20E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	5.04E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.01E-01
				PAHS												
				BENZO(A)ANTHRACENE	8.16E-02	(mg/kg)	5.79E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.23E-06	1.35E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	2.86E-02	(mg/kg)	2.03E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.48E-06	4.73E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	2.97E-02	(mg/kg)	2.11E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.54E-05	4.92E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.26E-02	(mg/kg)	3.02E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.20E-05	7.05E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.26E-02	(mg/kg)	3.02E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.20E-06	7.05E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**4.54E-05**					**3.34E-01**
		Exposure Point Total									**4.54E-05**					**3.34E-01**
	Exposure Medium Total										**1.12E-04**					**3.37E-01**
Surface Water Total											**1.12E-04**					**3.37E-01**
										Total of Receptor Risks Across All Media	**2.11E-04**				Total of Receptor Hazards Across All Media	**1.01E+00**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 6.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	2.68E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	4.02E-09	6.25E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	6.25E-04
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	3.51E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.27E-08	8.20E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.73E-03
				COBALT	1.98E+01	(mg/kg)	2.17E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.05E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.68E-03
				IRON	2.74E+04	(mg/kg)	3.00E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	7.00E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.00E-03
				VANADIUM	9.44E+01	(mg/kg)	1.03E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.41E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	1.85E-02
				PAHS												
				BENZO(A)ANTHRACENE	1.20E+00	(mg/kg)	5.12E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.74E-08	3.98E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.90E+00	(mg/kg)	8.11E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.92E-08	6.30E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	4.69E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.43E-07	3.65E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.49E-01	(mg/kg)	6.36E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.64E-08	4.94E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.70E-01	(mg/kg)	3.71E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.71E-08	2.89E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	8.15E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.63E-09	1.90E-08	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.71E-07**					**2.46E-02**
		Exposure Point Total									**5.71E-07**					**2.46E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	1.92E-06	(mg/kg)	1.70E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	2.21E-06	3.97E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	3.97E-01
				METALS												
				ARSENIC	5.79E-02	(mg/kg)	5.14E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.70E-07	1.20E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.00E-02
				COBALT	1.91E-01	(mg/kg)	1.69E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.95E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.32E-01
				IRON	1.27E+02	(mg/kg)	1.13E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.63E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.76E-02
				VANADIUM	5.11E+00	(mg/kg)	4.53E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.06E-03	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.12E-01
				PAHS												
				BENZO(A)ANTHRACENE	1.79E-01	(mg/kg)	4.76E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.48E-06	3.71E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.00E-02	(mg/kg)	2.40E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.75E-06	1.86E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	8.04E-02	(mg/kg)	2.14E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.56E-05	1.66E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.65E-02	(mg/kg)	7.05E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.15E-06	5.49E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.92E-02	(mg/kg)	1.31E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.56E-07	1.02E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	3.67E-01	(mg/kg)	3.26E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	6.51E-06	7.60E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.64E-05**					**8.18E-01**
		Exposure Point Total									**3.64E-05**					**8.18E-01**
	Exposure Medium Total										**3.70E-05**					**8.43E-01**
Sediment Total											**3.70E-05**					**8.43E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	3.91E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.87E-09	9.13E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.04E-04
				MANGANESE	8.14E-02	(mg/L)	6.80E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-06	(mg/kg-day)	4.67E-02	(mg/kg-day)	3.40E-05
				MERCURY	3.90E-05	(mg/L)	3.26E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	7.60E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.60E-06
				SELENIUM	1.26E-02	(mg/L)	1.05E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.45E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.90E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	3.51E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.56E-10	2.73E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	1.23E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.96E-11	9.55E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	1.28E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.33E-10	9.94E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	1.83E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.33E-09	1.42E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	1.83E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.33E-10	1.42E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.62E-09**					**3.95E-04**
			Dermal	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	1.29E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.94E-08	3.01E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.00E-03
				MANGANESE	8.14E-02	(mg/L)	2.24E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.24E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	2.80E-03
				MERCURY	3.90E-05	(mg/L)	1.07E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.51E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.51E-05
				SELENIUM	1.26E-02	(mg/L)	3.13E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.30E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.46E-04
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	1.50E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.10E-06	1.17E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	9.14E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.67E-07	7.11E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	9.37E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.84E-06	7.29E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	2.07E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.51E-05	1.61E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	1.36E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.95E-07	1.06E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**2.47E-05**					**3.98E-03**
		Exposure Point Total									**2.48E-05**					**4.38E-03**

TABLE 6.7.7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.87E-03	(mg/kg)	1.66E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.49E-08	3.88E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.29E-03
				MANGANESE	3.26E+01	(mg/kg)	2.89E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	6.74E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.44E-01
				MERCURY	7.02E-02	(mg/kg)	6.23E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.45E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.45E-01
				SELENIUM	3.04E+00	(mg/kg)	2.70E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	6.30E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.26E-01
				PAHS												
				BENZO(A)ANTHRACENE	8.16E-02	(mg/kg)	2.17E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.59E-06	1.69E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	2.86E-02	(mg/kg)	7.60E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.55E-07	5.91E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	2.97E-02	(mg/kg)	7.91E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.78E-06	6.15E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.26E-02	(mg/kg)	1.13E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.27E-06	8.81E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.26E-02	(mg/kg)	1.13E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.27E-07	8.81E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.70E-05**					**4.17E-01**
		Exposure Point Total									**1.70E-05**					**4.17E-01**
	Exposure Medium Total										**4.18E-05**					**4.21E-01**
Surface Water Total											**4.18E-05**					**4.21E-01**
										Total of Receptor Risks Across All Media	**7.88E-05**				Total of Receptor Hazards Across All Media	**1.26E+00**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 6.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	8.17E-06	(mg/kg)	1.25E-13	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.88E-08	2.92E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.92E-04
				METALS												
				ARSENIC	1.07E+01	(mg/kg)	1.64E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.46E-07	3.83E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.28E-03
				COBALT	1.98E+01	(mg/kg)	1.01E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.36E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.86E-04
				IRON	2.74E+04	(mg/kg)	1.40E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.26E-04	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.66E-04
				VANADIUM	9.44E+01	(mg/kg)	4.82E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.12E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	8.65E-03
				PAHS												
				BENZO(A)ANTHRACENE	1.20E+00	(mg/kg)	7.96E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.81E-08	1.86E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.90E+00	(mg/kg)	1.26E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.20E-08	2.94E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E+00	(mg/kg)	7.30E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.33E-07	1.70E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.49E-01	(mg/kg)	9.88E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.22E-08	2.31E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.70E-01	(mg/kg)	5.77E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.21E-08	1.35E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.32E-02	(mg/kg)	3.80E-09	(mg/kg-day)	2.00E+00	per (mg/kg-day)	7.60E-09	8.87E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.07E-06**					**1.15E-02**
		Exposure Point Total									**1.07E-06**					**1.15E-02**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	1.92E-06	(mg/kg)	1.44E-10	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.88E-05	3.37E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	3.37E-01
				METALS												
				ARSENIC	5.79E-02	(mg/kg)	4.36E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	6.53E-06	1.02E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.39E-02
				COBALT	1.91E-01	(mg/kg)	1.44E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.35E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.12E-01
				IRON	1.27E+02	(mg/kg)	9.55E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.23E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.18E-02
				VANADIUM	5.11E+00	(mg/kg)	3.84E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.97E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.79E-01
				PAHS												
				BENZO(A)ANTHRACENE	1.79E-01	(mg/kg)	1.35E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.83E-06	3.14E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	9.00E-02	(mg/kg)	6.77E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.94E-06	1.58E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	8.04E-02	(mg/kg)	6.05E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.42E-05	1.41E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.65E-02	(mg/kg)	1.99E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.46E-05	4.65E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.92E-02	(mg/kg)	3.70E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.70E-06	8.64E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	3.67E-01	(mg/kg)	2.76E-05	(mg/kg-day)	2.00E+00	per (mg/kg-day)	5.52E-05	6.44E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.57E-04**					**6.94E-01**
		Exposure Point Total									**1.57E-04**					**6.94E-01**
	Exposure Medium Total										**1.58E-04**					**7.05E-01**
Sediment Total											**1.58E-04**					**7.05E-01**
Surface Water	Surface Water	Patapsco River	Dermal	**METALS**												
				ARSENIC	4.69E-03	(mg/L)	9.57E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.43E-07	2.23E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.44E-04
				MANGANESE	8.14E-02	(mg/L)	1.66E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.88E-06	(mg/kg-day)	1.87E-03	(mg/kg-day)	2.08E-03
				MERCURY	3.90E-05	(mg/L)	7.96E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.86E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.86E-05
				SELENIUM	1.26E-02	(mg/L)	2.32E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	5.41E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.08E-04
				PAHS												
				BENZO(A)ANTHRACENE	1.40E-04	(mg/L)	9.27E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.77E-07	2.16E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	4.90E-05	(mg/L)	5.64E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.12E-07	1.32E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	5.10E-05	(mg/L)	5.79E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.22E-06	1.35E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.30E-05	(mg/L)	1.28E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.34E-06	2.98E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	7.30E-05	(mg/L)	8.41E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.14E-07	1.96E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.54E-05**					**2.95E-03**
		Exposure Point Total									**1.54E-05**					**2.95E-03**

TABLE 6.7.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.87E-03	(mg/kg)	1.41E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.12E-07	3.29E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.10E-03
				MANGANESE	3.26E+01	(mg/kg)	2.45E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	5.72E-03	(mg/kg-day)	4.67E-02	(mg/kg-day)	1.23E-01
				MERCURY	7.02E-02	(mg/kg)	5.28E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.23E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.23E-01
				SELENIUM	3.04E+00	(mg/kg)	2.29E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.34E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.07E-01
				PAHS												
				BENZO(A)ANTHRACENE	8.16E-02	(mg/kg)	6.14E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.48E-06	1.43E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	2.86E-02	(mg/kg)	2.15E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.57E-06	5.01E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	2.97E-02	(mg/kg)	2.24E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.63E-05	5.22E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	4.26E-02	(mg/kg)	3.20E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.34E-05	7.47E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	4.26E-02	(mg/kg)	3.20E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.34E-06	7.47E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**4.83E-05**					**3.54E-01**
		Exposure Point Total									**4.83E-05**					**3.54E-01**
	Exposure Medium Total										**6.37E-05**					**3.57E-01**
Surface Water Total											**6.37E-05**					**3.57E-01**
										Total of Receptor Risks Across All Media	**2.21E-04**				Total of Receptor Hazards Across All Media	**1.06E+00**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 6.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 6.7.9
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	9.80E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.5E-06
BENZO(B)FLUORANTHENE	9.84E-01	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.4E-06
BENZO(K)FLUORANTHENE	1.02E+00	7.00E-01	-1.74E-01	252.32	6.12	4.28E+00	6.12E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.6E-06
BENZO(A)PYRENE	7.59E-01	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	3.4E-06
CHRYSENE	1.09E+00	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	2.8E-06
DIBENZ(A,H)ANTHRACENE	1.22E+00	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	8.4E-06
INDENO(1,2,3-C,D)PYRENE	1.16E+00	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	5.2E-06
BENZENE	1.25E+01	1.50E-02	-1.83E+00	78.10	2.13	5.10E-02	5.79E-07	2.88E-01	3.35E-01	3.68E-01	6.91E-01	4.7E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).
(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.
-- = Not applicable
B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis

cm/hr = Centimeter per hour
cm^2/hr = Square centimeter per hour
DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario
D_{sc} = Effective diffusivity for chemical transfer through the skin
U.S. EPA = U.S. Environmental Protection Agency
EPC = Exposure point concentration (see Table 6.3.2)
g/mol = Gram per mole
hr = Hour
K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics
Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)
Log K_p = Log of the dermal permeability coefficient

ug/L = Microgram per liter
mg/cm^2-event = Milligram per square centimeter per event
MW = Molecular weight
τ_{event} = Lag time per event
t* = Time it takes to reach steady-state

TABLE 6.7.10
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
WATERMAN - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
COKE POINT OFFSHORE AREA

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	9.80E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	5.1E-06
BENZO(B)FLUORANTHENE	9.84E-01	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	8.9E-06
BENZO(K)FLUORANTHENE	1.02E+00	7.00E-01	-1.74E-01	252.32	6.12	4.28E+00	6.12E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	9.2E-06
BENZO(A)PYRENE	7.59E-01	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	6.8E-06
CHRYSENE	1.09E+00	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	5.6E-06
DIBENZ(A,H)ANTHRACENE	1.22E+00	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	1.7E-05
INDENO(1,2,3-C,D)PYRENE	1.16E+00	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	1.0E-05
BENZENE	1.25E+01	1.50E-02	-1.83E+00	78.10	2.13	5.10E-02	5.79E-07	2.88E-01	3.35E-01	3.68E-01	6.91E-01	1.5E-06

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).

(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.

-- = Not applicable

B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis

cm/hr = Centimeter per hour

cm^2/hr = Square centimeter per hour

DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario

D_{sc} = Effective diffusivity for chemical transfer through the skin

U.S. EPA = U.S. Environmental Protection Agency

EPC = Exposure point concentration (see Table 6.3.2)

g/mol = Gram per mole

hr = Hour

K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics

Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)

Log K_p = Log of the dermal permeability coefficient

ug/L = Microgram per liter

mg/cm^2-event = Milligram per square centimeter per event

MW = Molecular weight

τ_{event} = Lag time per event

t* = Time it takes to reach steady-state

TABLE 6.7.11
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
RECREATIONAL USER - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	1.40E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	3.6E-07
BENZO(A)PYRENE	5.10E-02	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	2.3E-07
BENZO(B)FLUORANTHENE	4.90E-02	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	2.2E-07
DIBENZ(A,H)ANTHRACENE	7.30E-02	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	5.0E-07
INDENO(1,2,3-C,D)PYRENE	7.30E-02	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	3.3E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).
(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.
-- = Not applicable
B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis
cm/hr = Centimeter per hour
cm^2/hr = Square centimeter per hour
DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario
D_{sc} = Effective diffusivity for chemical transfer through the skin
U.S. EPA = U.S. Environmental Protection Agency
EPC = Exposure point concentration (see Table 6.3.6)
g/mol = Gram per mole
hr = Hour
K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics
Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)
Log K_p = Log of the dermal permeability coefficient
ug/L = Microgram per liter
mg/cm^2-event = Milligram per square centimeter per event
MW = Molecular weight
τ_{event} = Lag time per event
t* = Time it takes to reach steady-state

TABLE 6.7.12
CALCULATION OF DERMALLY ABSORBED DOSE FROM SURFACE WATER
WATERMAN - REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Contaminant of Potential Concern	EPC (ug/L)	K_p (cm/hr)	Log K_p	MW (g/mole)	Log K_{ow}	B (unitless)	D_{sc} (cm^2/hr)	τ_{event} (hr)	b	c	t* (hr)	DA(1) (mg/cm^2-event)
BENZO(A)ANTHRACENE	1.40E-01	4.70E-01	-3.43E-01	228.30	5.66	2.73E+00	8.35E-08	2.00E+00	6.04E+00	2.82E+00	8.37E+00	7.3E-07
BENZO(A)PYRENE	5.10E-02	7.00E-01	-1.74E-01	250.00	6.10	4.26E+00	6.31E-08	2.64E+00	1.33E+01	4.32E+00	1.15E+01	4.5E-07
BENZO(B)FLUORANTHENE	4.90E-02	7.00E-01	-1.74E-01	252.30	6.12	4.28E+00	6.13E-08	2.72E+00	1.34E+01	4.34E+00	1.18E+01	4.4E-07
DIBENZ(A,H)ANTHRACENE	7.30E-02	1.50E+00	1.55E-01	278.40	6.84	9.63E+00	4.37E-08	3.81E+00	6.22E+01	9.66E+00	1.72E+01	1.0E-06
INDENO(1,2,3-C,D)PYRENE	7.30E-02	1.00E+00	-4.48E-03	276.30	6.58	6.39E+00	4.49E-08	3.71E+00	2.84E+01	6.44E+00	1.65E+01	6.6E-07

Notes:

(1)Dermal exposure from organics during swimming was evaluated for those chemicals with a permeability coefficient greater than 1E-02 cm/hr (U.S. EPA 2004).
(2)Please refer to U.S. EPA 2004, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation (Part E. Supplemental Guuidance for Dermal Risk Assesment) for all equations to calculate Log K_p, B, D_{sc}, τ_{even}t, b, c, t*, and DA.
-- = Not applicable
B = Ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis
cm/hr = Centimeter per hour
cm^2/hr = Square centimeter per hour
DA = Dose absorbed per event per area of skin exposed for the adult and child resident scenario
D_{sc} = Effective diffusivity for chemical transfer through the skin
U.S. EPA = U.S. Environmental Protection Agency
EPC = Exposure point concentration (see Table 6.3.6)
g/mol = Gram per mole
hr = Hour
K_p = Dermal permeability coefficient of compound in water; per U.S. EPA 2004, Appendix B for organics
Log K_{ow} = Log octanol/water partition coefficient (Primary source: U.S. EPA 2004)
Log K_p = Log of the dermal permeability coefficient
ug/L = Microgram per liter
mg/cm^2-event = Milligram per square centimeter per event
MW = Molecular weight
τ_{event} = Lag time per event
t* = Time it takes to reach steady-state

TABLE 6.9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	7.1E-08	1.3E-07	--	2.0E-07	ARSENIC	Skin	3.7E-04	6.6E-04	--	1.0E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	3.8E-05	1.7E-03	--	1.7E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.4E-05	2.6E-05	--	4.0E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.7E-05	1.1E-04	--	1.8E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	7.7E-09	1.8E-05	--	1.8E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	7.7E-09	3.1E-05	--	3.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	8.0E-10	3.3E-06	--	3.3E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.9E-08	2.4E-04	--	2.4E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	8.5E-11	2.0E-07	--	2.0E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	9.6E-08	5.9E-04	--	5.9E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	9.1E-09	3.7E-05	--	3.7E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	7.4E-09	2.5E-07	--	2.6E-07	BENZENE	Liver	7.8E-05	2.6E-03	--	2.7E-03
			(Total)	2.6E-07	9.2E-04	---	9.2E-04		(Total)	5.6E-04	5.1E-03	---	5.7E-03
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.6E-07	--	--	1.6E-07	ARSENIC	Skin	8.4E-04	--	--	8.4E-04
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	8.7E-02	--	--	8.7E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.5E-01	--	--	1.5E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	9.4E-02	--	--	9.4E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	2.6E-05	--	--	2.6E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	2.6E-05	--	--	2.6E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	2.7E-06	--	--	2.7E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.0E-04	--	--	2.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	2.9E-07	--	--	2.9E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.2E-04	--	--	3.2E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.0E-05	--	--	3.0E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	5.0E-07	--	--	5.0E-07	BENZENE	Liver	5.3E-03	--	--	5.3E-03
			(Total for Finfish)	6.1E-04	---	---	6.1E-04		(Total for Finfish)	3.4E-01	---	---	3.4E-01
							Total Risk Across Surface Water	**1.5E-03**				**Total Hazard Index Across Surface Water**	**3.4E-01**

TABLE 6.9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.7E-08	--	1.7E-08	DIOXIN (TEQ)	Developmental	--	2.6E-04	--	2.6E-04
			METALS					**METALS**					
			ARSENIC	--	1.8E-07	--	1.8E-07	ARSENIC	Skin	--	9.4E-04	--	9.4E-04
			COBALT	--	--	--	NA	COBALT	Blood	--	3.3E-04	--	3.3E-04
			IRON	--	--	--	NA	IRON	None	--	3.7E-04	--	3.7E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	3.0E-03	--	3.0E-03
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	1.9E-07	--	1.9E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.7E-07	--	1.7E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.7E-06	--	1.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	1.7E-09	--	1.7E-09	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.4E-07	--	3.4E-07	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	--	3.3E-05	--	3.3E-05
			INDENO(1,2,3-C,D)PYRENE	--	9.6E-08	--	9.6E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	--	7.3E-10	--	7.3E-10	1-METHYLNAPHTHALENE	Respiratory System	--	8.4E-07	--	8.4E-07
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	4.7E-03	--	4.7E-03
			PYRENE	--	--	--	NA	PYRENE	Kidneys	--	2.3E-05	--	2.3E-05
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.1E-08	--	1.1E-08	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	3.2E-13	--	3.2E-13	BENZENE	Liver	--	3.4E-09	--	3.4E-09
			(Total)	---	2.7E-06	---	2.7E-06		(Total)	---	9.7E-03	---	9.7E-03
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-05	--	--	4.9E-05	DIOXIN (TEQ)	Developmental	8.8E-01	--	--	8.8E-01
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	7.2E-02	--	--	7.2E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.4E-01	--	--	1.4E-01
			IRON	--	--	--	NA	IRON	None	7.3E-02	--	--	7.3E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.8E-01	--	--	1.8E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.2E-05	--	--	9.2E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	2.7E-05	--	--	2.7E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.1E-04	--	--	4.1E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	8.3E-07	--	--	8.3E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.0E-04	--	--	2.0E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	3.4E-02	--	--	3.4E-02
			INDENO(1,2,3-C,D)PYRENE	1.8E-05	--	--	1.8E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	4.0E-07	--	--	4.0E-07	1-METHYLNAPHTHALENE	Respiratory System	4.6E-04	--	--	4.6E-04
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	2.7E-01	--	--	2.7E-01
			PYRENE	--	--	--	NA	PYRENE	Kidneys	2.6E-02	--	--	2.6E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.3E-04	--	--	2.3E-04	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	2.7E-07	--	--	2.7E-07	BENZENE	Liver	2.8E-03	--	--	2.8E-03
			(Total for Crabs)	1.0E-03	---	---	1.0E-03		(Total for Crabs)	1.7E+00	---	---	1.7E+00
							Total Risk Across Sediment						**Total Hazard Index Across Sediment**
							1.0E-03						**1.7E+00**
							Total Risk Across All Media and All Exposure Routes						**Total Hazard Index Across All Media and All Exposure Routes**
							2.6E-03						**2.0E+00**

TABLE 6.9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.8E-08	4.9E-08	--	6.7E-08	ARSENIC	Skin	2.8E-04	7.6E-04	--	1.0E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	2.9E-05	2.0E-03	--	2.0E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.1E-05	3.0E-05	--	4.1E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	5.2E-05	1.3E-04	--	1.8E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	6.0E-09	2.1E-05	--	2.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.0E-09	3.6E-05	--	3.6E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	6.2E-10	3.8E-06	--	3.8E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.6E-08	2.7E-04	--	2.7E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	6.6E-11	2.3E-07	--	2.3E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	7.4E-08	6.8E-04	--	6.8E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	7.0E-09	4.2E-05	--	4.2E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.9E-09	9.6E-08	--	9.8E-08	BENZENE	Liver	6.1E-05	3.1E-03	--	3.1E-03
			(Total)	1.6E-07	1.1E-03	---	1.1E-03		(Total)	4.4E-04	5.9E-03	---	6.4E-03
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	6.2E-08	--	--	6.2E-08	ARSENIC	Skin	9.7E-04	--	--	9.7E-04
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.9E-02	--	--	9.9E-02
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.7E-01	--	--	1.7E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.0E-05	--	--	3.0E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.0E-05	--	--	3.0E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.1E-06	--	--	3.1E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.3E-04	--	--	2.3E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	3.3E-07	--	--	3.3E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.7E-04	--	--	3.7E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	--	--	3.5E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.9E-07	--	--	1.9E-07	BENZENE	Liver	6.1E-03	--	--	6.1E-03
			(Total for Finfish)	7.0E-04	---	---	7.0E-04		(Total for Finfish)	3.9E-01	---	---	3.9E-01
							Total Risk Across Surface Water						**Total Hazard Index Across Surface Water**
							1.8E-03						**3.9E-01**

TABLE 6.9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	2.5E-08	--	2.5E-08	DIOXIN (TEQ)	Developmental	--	1.2E-03	--	1.2E-03
			METALS					**METALS**					
			ARSENIC	--	2.7E-07	--	2.7E-07	ARSENIC	Skin	--	4.2E-03	--	4.2E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	1.5E-03	--	1.5E-03
			IRON	--	--	--	NA	IRON	None	--	1.6E-03	--	1.6E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	1.3E-02	--	1.3E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	8.4E-07	--	8.4E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	7.8E-07	--	7.8E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	7.7E-06	--	7.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	7.8E-09	--	7.8E-09	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.5E-06	--	1.5E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	--	1.5E-04	--	1.5E-04
			INDENO(1,2,3-C,D)PYRENE	--	4.3E-07	--	4.3E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	--	1.1E-09	--	1.1E-09	1-METHYLNAPHTHALENE	Respiratory System	--	3.7E-06	--	3.7E-06
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	2.1E-02	--	2.1E-02
			PYRENE	--	--	--	NA	PYRENE	Kidneys	--	1.0E-04	--	1.0E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.6E-08	--	1.6E-08	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	4.7E-13	--	4.7E-13	BENZENE	Liver	--	1.5E-08	--	1.5E-08
			(Total)	---	1.2E-05	---	1.2E-05		(Total)	---	4.3E-02	---	4.3E-02
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	1.0E+00	--	--	1.0E+00
			METALS					**METALS**					
			ARSENIC	5.3E-06	--	--	5.3E-06	ARSENIC	Skin	8.3E-02	--	--	8.3E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.6E-01	--	--	1.6E-01
			IRON	--	--	--	NA	IRON	None	8.4E-02	--	--	8.4E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.1E-01	--	--	2.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-04	--	--	1.1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.1E-05	--	--	3.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.7E-04	--	--	4.7E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	9.5E-07	--	--	9.5E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.3E-04	--	--	2.3E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	3.9E-02	--	--	3.9E-02
			INDENO(1,2,3-C,D)PYRENE	2.0E-05	--	--	2.0E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	1.5E-07	--	--	1.5E-07	1-METHYLNAPHTHALENE	Respiratory System	5.3E-04	--	--	5.3E-04
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.1E-01	--	--	3.1E-01
			PYRENE	--	--	--	NA	PYRENE	Kidneys	3.0E-02	--	--	3.0E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	8.7E-05	--	--	8.7E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.0E-07	--	--	1.0E-07	BENZENE	Liver	3.3E-03	--	--	3.3E-03
			(Total for Crabs)	9.7E-04	---	---	9.7E-04		(Total for Crabs)	1.9E+00	---	---	1.9E+00
							Total Risk Across Sediment						**Total Hazard Index Across Sediment**
							9.8E-04						**2.0E+00**
							Total Risk Across All Media and All Exposure Routes						**Total Hazard Index Across All Media and All Exposure Routes**
							2.7E-03						**2.4E+00**

TABLE 6.9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	1.4E-08	1.8E-08	--	3.2E-08	ARSENIC	Skin	7.1E-04	9.4E-04	--	1.6E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	7.3E-05	2.4E-03	--	2.5E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	2.8E-05	3.7E-05	--	6.5E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.3E-04	1.6E-04	--	2.9E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.5E-09	7.7E-06	--	7.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.5E-09	1.3E-05	--	1.3E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	4.7E-10	1.4E-06	--	1.4E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.5E-08	1.0E-04	--	1.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	5.0E-11	8.5E-08	--	8.5E-08	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	5.6E-08	2.5E-04	--	2.5E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	5.3E-09	1.6E-05	--	1.6E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	1.4E-09	3.6E-08	--	3.7E-08	BENZENE	Liver	1.5E-04	3.8E-03	--	3.9E-03
			(Total)	1.2E-07	3.9E-04	---	3.9E-04		(Total)	1.1E-03	7.3E-03	---	8.4E-03
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	2.3E-08	--	--	2.3E-08	ARSENIC	Skin	1.2E-03	--	--	1.2E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	2.1E-01	--	--	2.1E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.3E-01	--	--	1.3E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-05	--	--	1.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.1E-05	--	--	1.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	1.2E-06	--	--	1.2E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	8.6E-05	--	--	8.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	1.2E-07	--	--	1.2E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.4E-04	--	--	1.4E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.3E-05	--	--	1.3E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	7.2E-08	--	--	7.2E-08	BENZENE	Liver	7.6E-03	--	--	7.6E-03
			(Total for Finfish)	2.6E-04	---	---	2.6E-04		(Total for Finfish)	4.8E-01	---	---	4.8E-01
							Total Risk Across Surface Water	**6.5E-04**					**Total Hazard Index Across Surface Water**	**4.9E-01**

TABLE 6.9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.3E-08	--	1.3E-08	DIOXIN (TEQ)	Developmental	--	2.0E-03	--	2.0E-03
			METALS					**METALS**					
			ARSENIC	--	1.4E-07	--	1.4E-07	ARSENIC	Skin	--	7.1E-03	--	7.1E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	2.5E-03	--	2.5E-03
			IRON	--	--	--	NA	IRON	None	--	2.8E-03	--	2.8E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	2.3E-02	--	2.3E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	4.3E-07	--	4.3E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	3.9E-07	--	3.9E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	3.9E-06	--	3.9E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	3.9E-09	--	3.9E-09	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	7.7E-07	--	7.7E-07	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	--	2.5E-04	--	2.5E-04
			INDENO(1,2,3-C,D)PYRENE	--	2.2E-07	--	2.2E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	--	5.5E-10	--	5.5E-10	1-METHYLNAPHTHALENE	Respiratory System	--	6.3E-06	--	6.3E-06
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	3.6E-02	--	3.6E-02
			PYRENE	--	--	--	NA	PYRENE	Kidneys	--	1.7E-04	--	1.7E-04
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	8.1E-09	--	8.1E-09	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	2.4E-13	--	2.4E-13	BENZENE	Liver	--	2.5E-08	--	2.5E-08
			(Total)	---	5.9E-06	---	5.9E-06		(Total)	---	7.3E-02	---	7.3E-02
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-06	--	--	7.0E-06	DIOXIN (TEQ)	Developmental	1.3E+00	--	--	1.3E+00
			METALS					**METALS**					
			ARSENIC	2.0E-06	--	--	2.0E-06	ARSENIC	Skin	1.0E-01	--	--	1.0E-01
			COBALT	--	--	--	NA	COBALT	Blood	2.0E-01	--	--	2.0E-01
			IRON	--	--	--	NA	IRON	None	1.0E-01	--	--	1.0E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.6E-01	--	--	2.6E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.0E-05	--	--	4.0E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.2E-05	--	--	1.2E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.8E-04	--	--	1.8E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	3.6E-07	--	--	3.6E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	8.5E-05	--	--	8.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	4.8E-02	--	--	4.8E-02
			INDENO(1,2,3-C,D)PYRENE	7.7E-06	--	--	7.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	5.8E-08	--	--	5.8E-08	1-METHYLNAPHTHALENE	Respiratory System	6.6E-04	--	--	6.6E-04
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.9E-01	--	--	3.9E-01
			PYRENE	--	--	--	NA	PYRENE	Kidneys	3.7E-02	--	--	3.7E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.2E-05	--	--	3.2E-05	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	3.9E-08	--	--	3.9E-08	BENZENE	Liver	4.1E-03	--	--	4.1E-03
			(Total for Crabs)	3.6E-04	---	---	3.6E-04		(Total for Crabs)	2.4E+00	---	---	2.4E+00
							Total Risk Across Sediment	**3.7E-04**					**Total Hazard Index Across Sediment**	**2.5E+00**
							Total Risk Across All Media and All Exposure Routes	**1.0E-03**					**Total Hazard Index Across All Media and All Exposure Routes**	**3.0E+00**

TABLE 6.9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**METALS**					**METALS**					
			ARSENIC	--	1.3E-07	--	1.3E-07	ARSENIC	Skin	--	7.0E-04	--	7.0E-04
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	--	1.8E-03	--	1.8E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	2.7E-05	--	2.7E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	1.2E-04	--	1.2E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	9.5E-06	--	9.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.7E-05	--	1.7E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	1.7E-06	--	1.7E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.3E-04	--	1.3E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	1.0E-07	--	1.0E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.1E-04	--	3.1E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.9E-05	--	1.9E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	2.2E-07	--	2.2E-07	BENZENE	Liver	--	2.3E-03	--	2.3E-03
			(Total)	---	4.9E-04	---	4.9E-04		(Total)	---	4.9E-03	---	4.9E-03
	Finfish	Coke Point	**METALS**					**METALS**					
			ARSENIC	2.0E-07	--	--	2.0E-07	ARSENIC	Skin	1.0E-03	--	--	1.0E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	--	1.1E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.8E-01	--	--	1.8E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.1E-05	--	--	3.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.2E-05	--	--	3.2E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.3E-06	--	--	3.3E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.4E-04	--	--	2.4E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	3.5E-07	--	--	3.5E-07	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.9E-04	--	--	3.9E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.7E-05	--	--	3.7E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	6.1E-07	--	--	6.1E-07	BENZENE	Liver	6.5E-03	--	--	6.5E-03
			(Total for Finfish)	7.4E-04	---	---	7.4E-04		(Total for Finfish)	4.1E-01	---	---	4.1E-01
						Total Risk Across Surface Water	**1.2E-03**					**Total Hazard Index Across Surface Water**	**4.1E-01**

TABLE 6.9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area
Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	5.9E-08	--	5.9E-08	DIOXIN (TEQ)	Developmental	--	9.3E-04	--	9.3E-04
			METALS					**METALS**					
			ARSENIC	--	6.3E-07	--	6.3E-07	ARSENIC	Skin	--	3.3E-03	--	3.3E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	1.2E-03	--	1.2E-03
			IRON	--	--	--	NA	IRON	None	--	1.3E-03	--	1.3E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	1.1E-02	--	1.1E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	6.6E-07	--	6.6E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	6.1E-07	--	6.1E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.1E-06	--	6.1E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	--	6.1E-09	--	6.1E-09	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.2E-06	--	1.2E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	--	1.2E-04	--	1.2E-04
			INDENO(1,2,3-C,D)PYRENE	--	3.4E-07	--	3.4E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	--	2.6E-09	--	2.6E-09	1-METHYLNAPHTHALENE	Respiratory System	--	2.9E-06	--	2.9E-06
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	--	1.7E-02	--	1.7E-02
			PYRENE	--	--	--	NA	PYRENE	Kidneys	--	8.1E-05	--	8.1E-05
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	3.8E-08	--	3.8E-08	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	--	1.1E-12	--	1.1E-12	BENZENE	Liver	--	1.2E-08	--	1.2E-08
			(Total)	---	9.6E-06	---	9.6E-06		(Total)	---	3.4E-02	---	3.4E-02
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	6.0E-05	--	--	6.0E-05	DIOXIN (TEQ)	Developmental	1.1E+00	--	--	1.1E+00
			METALS					**METALS**					
			ARSENIC	1.7E-05	--	--	1.7E-05	ARSENIC	Skin	8.7E-02	--	--	8.7E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.7E-01	--	--	1.7E-01
			IRON	--	--	--	NA	IRON	None	8.9E-02	--	--	8.9E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.2E-01	--	--	2.2E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-04	--	--	1.1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.3E-05	--	--	3.3E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.0E-04	--	--	5.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	1.0E-06	--	--	1.0E-06	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.4E-04	--	--	2.4E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			FLUORANTHENE	--	--	--	NA	FLUORANTHENE	Liver	4.1E-02	--	--	4.1E-02
			INDENO(1,2,3-C,D)PYRENE	2.2E-05	--	--	2.2E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			1-METHYLNAPHTHALENE	4.9E-07	--	--	4.9E-07	1-METHYLNAPHTHALENE	Respiratory System	5.6E-04	--	--	5.6E-04
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.3E-01	--	--	3.3E-01
			PYRENE	--	--	--	NA	PYRENE	Kidneys	3.2E-02	--	--	3.2E-02
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.8E-04	--	--	2.8E-04	TOTAL PCB's	NA	--	--	--	NA
			VOLATILES					**VOLATILES**					
			BENZENE	3.3E-07	--	--	3.3E-07	BENZENE	Liver	3.5E-03	--	--	3.5E-03
			(Total for Crabs)	1.3E-03	---	---	1.3E-03		(Total for Crabs)	2.0E+00	---	---	2.0E+00
						Total Risk Across Sediment	**1.3E-03**					**Total Hazard Index Across Sediment**	**2.1E+00**
						Total Risk Across All Media and All Exposure Routes	**2.5E-03**					**Total Hazard Index Across All Media and All Exposure Routes**	**2.5E+00**

TABLE 6.9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	7.5E-08	1.4E-07	--	2.1E-07	ARSENIC	Skin	3.9E-04	7.0E-04	--	1.1E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	4.4E-05	2.0E-03	--	2.0E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.8E-06	1.8E-05	--	2.7E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.3E-05	1.0E-04	--	1.7E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-09	2.6E-06	--	2.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.8E-10	1.6E-06	--	1.6E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.0E-09	1.6E-05	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	5.7E-09	3.5E-05	--	3.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	5.7E-10	2.3E-06	--	2.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	8.7E-08	5.8E-05	---	5.8E-05		(Total)	5.1E-04	2.8E-03	---	3.3E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	1.7E-07	--	--	1.7E-07	ARSENIC	Skin	9.0E-04	--	--	9.0E-04
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.0E-01	--	--	1.0E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.0E-01	--	--	1.0E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	8.8E-02	--	--	8.8E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.7E-06	--	--	3.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.3E-06	--	--	1.3E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.3E-05	--	--	1.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.9E-05	--	--	1.9E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.9E-06	--	--	1.9E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	4.0E-05	---	---	4.0E-05		(Total for Finfish)	2.9E-01	---	---	2.9E-01
						Total Risk Across Surface Water	**9.8E-05**					**Total Hazard Index Across Surface Water**	**2.9E-01**

TABLE 6.9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	5.3E-09	--	5.3E-09	DIOXIN (TEQ)	Developmental	--	8.3E-05	--	8.3E-05
			METALS					**METALS**					
			ARSENIC	--	7.0E-08	--	7.0E-08	ARSENIC	Skin	--	3.6E-04	--	3.6E-04
			COBALT	--	--	--	NA	COBALT	Blood	--	2.2E-04	--	2.2E-04
			IRON	--	--	--	NA	IRON	None	--	1.3E-04	--	1.3E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	2.5E-03	--	2.5E-03
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	1.7E-08	--	1.7E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	2.6E-08	--	2.6E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.5E-07	--	1.5E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	2.1E-08	--	2.1E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.2E-08	--	1.2E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	2.2E-09	--	2.2E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	3.0E-07	---	3.0E-07		(Total)	---	3.3E-03	---	3.3E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.5E-05	--	--	1.5E-05	DIOXIN (TEQ)	Developmental	2.8E-01	--	--	2.8E-01
			METALS					**METALS**					
			ARSENIC	5.4E-06	--	--	5.4E-06	ARSENIC	Skin	2.8E-02	--	--	2.8E-02
			COBALT	--	--	--	NA	COBALT	Blood	9.2E-02	--	--	9.2E-02
			IRON	--	--	--	NA	IRON	None	2.6E-02	--	--	2.6E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.5E-01	--	--	1.5E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	8.1E-06	--	--	8.1E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.1E-06	--	--	4.1E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.6E-05	--	--	3.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.2E-05	--	--	1.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.2E-06	--	--	2.2E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	4.5E-05	--	--	4.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.3E-04	---	---	1.3E-04		(Total for Crabs)	5.7E-01	---	---	5.7E-01
							Total Risk Across Sediment	**1.3E-04**					**Total Hazard Index Across Sediment**	**5.7E-01**
							Total Risk Across All Media and All Exposure Routes	**2.3E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**8.7E-01**

TABLE 6.9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	2.0E-08	5.2E-08	--	7.2E-08	ARSENIC	Skin	3.0E-04	8.1E-04	--	1.1E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	3.4E-05	2.3E-03	--	2.3E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	7.6E-06	2.0E-05	--	2.8E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.9E-05	1.2E-04	--	1.7E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	8.5E-10	3.0E-06	--	3.0E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.0E-10	1.8E-06	--	1.8E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.1E-09	1.8E-05	--	1.8E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	4.4E-09	4.1E-05	--	4.1E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	4.4E-10	2.7E-06	--	2.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	2.9E-08	6.7E-05	---	6.7E-05		(Total)	3.9E-04	3.2E-03	---	3.6E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	6.7E-08	--	--	6.7E-08	ARSENIC	Skin	1.0E-03	--	--	1.0E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-01	--	--	1.2E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.0E-01	--	--	1.0E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.2E-06	--	--	4.2E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.5E-06	--	--	1.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.5E-05	--	--	1.5E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.2E-05	--	--	2.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.2E-06	--	--	2.2E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	4.5E-05	---	---	4.5E-05		(Total for Finfish)	3.3E-01	---	---	3.3E-01
							Total Risk Across Surface Water						**Total Hazard Index Across Surface Water**
							1.1E-04						**3.4E-01**

TABLE 6.9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	7.9E-09	--	7.9E-09	DIOXIN (TEQ)	Developmental	--	3.7E-04	--	3.7E-04
			METALS					**METALS**					
			ARSENIC	--	1.0E-07	--	1.0E-07	ARSENIC	Skin	--	1.6E-03	--	1.6E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	1.0E-03	--	1.0E-03
			IRON	--	--	--	NA	IRON	None	--	5.9E-04	--	5.9E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	1.1E-02	--	1.1E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	7.4E-08	--	7.4E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.2E-07	--	1.2E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.7E-07	--	6.7E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.1E-08	--	9.1E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	5.3E-08	--	5.3E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	3.2E-09	--	3.2E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	1.1E-06	---	1.1E-06		(Total)	---	1.5E-02	---	1.5E-02
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	5.9E-06	--	--	5.9E-06	DIOXIN (TEQ)	Developmental	3.2E-01	--	--	3.2E-01
			METALS					**METALS**					
			ARSENIC	2.1E-06	--	--	2.1E-06	ARSENIC	Skin	3.2E-02	--	--	3.2E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.1E-01	--	--	1.1E-01
			IRON	--	--	--	NA	IRON	None	3.0E-02	--	--	3.0E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.7E-01	--	--	1.7E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.3E-06	--	--	9.3E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.7E-06	--	--	4.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.2E-05	--	--	4.2E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.4E-05	--	--	1.4E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.5E-06	--	--	2.5E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.7E-05	--	--	1.7E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	9.7E-05	---	---	9.7E-05		(Total for Crabs)	6.5E-01	---	---	6.5E-01
							Total Risk Across Sediment						**Total Hazard Index Across Sediment**
							9.8E-05						**6.7E-01**
							Total Risk Across All Media and All Exposure Routes						**Total Hazard Index Across All Media and All Exposure Routes**
							2.1E-04						**1.0E+00**

TABLE 6.9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	5.9E-09	1.9E-08	--	2.5E-08	ARSENIC	Skin	3.0E-04	1.0E-03	--	1.3E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	3.4E-05	2.8E-03	--	2.8E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	7.6E-06	2.5E-05	--	3.3E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.9E-05	1.5E-04	--	1.9E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	2.6E-10	1.1E-06	--	1.1E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	9.0E-11	6.7E-07	--	6.7E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	9.3E-10	6.8E-06	--	6.8E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.3E-09	1.5E-05	--	1.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.3E-10	9.9E-07	--	9.9E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	8.6E-09	2.5E-05	---	2.5E-05		(Total)	3.9E-04	4.0E-03	---	4.4E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	2.5E-08	--	--	2.5E-08	ARSENIC	Skin	1.3E-03	--	--	1.3E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.4E-01	--	--	1.4E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.5E-01	--	--	1.5E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.3E-01	--	--	1.3E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.6E-06	--	--	1.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	5.6E-07	--	--	5.6E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.8E-06	--	--	5.8E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	8.3E-06	--	--	8.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	8.3E-07	--	--	8.3E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	1.7E-05	---	---	1.7E-05		(Total for Finfish)	4.2E-01	---	---	4.2E-01
							Total Risk Across Surface Water	**4.2E-05**				**Total Hazard Index Across Surface Water**	**4.2E-01**

TABLE 6.9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	4.0E-09	--	4.0E-09	DIOXIN (TEQ)	Developmental	--	6.3E-04	--	6.3E-04
			METALS					**METALS**					
			ARSENIC	--	5.3E-08	--	5.3E-08	ARSENIC	Skin	--	2.7E-03	--	2.7E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	1.7E-03	--	1.7E-03
			IRON	--	--	--	NA	IRON	None	--	1.0E-03	--	1.0E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	--	1.9E-02	--	1.9E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	3.7E-08	--	3.7E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	5.9E-08	--	5.9E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	3.4E-07	--	3.4E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	4.6E-08	--	4.6E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	2.7E-08	--	2.7E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.6E-09	--	1.6E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	5.7E-07	---	5.7E-07		(Total)	---	2.5E-02	---	2.5E-02
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	2.2E-06	--	--	2.2E-06	DIOXIN (TEQ)	Developmental	4.0E-01	--	--	4.0E-01
			METALS					**METALS**					
			ARSENIC	7.7E-07	--	--	7.7E-07	ARSENIC	Skin	4.0E-02	--	--	4.0E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.3E-01	--	--	1.3E-01
			IRON	--	--	--	NA	IRON	None	3.8E-02	--	--	3.8E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.1E-01	--	--	2.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.5E-06	--	--	3.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.7E-06	--	--	1.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.6E-05	--	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	5.1E-06	--	--	5.1E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	9.6E-07	--	--	9.6E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	6.5E-06	--	--	6.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	3.6E-05	---	---	3.6E-05		(Total for Crabs)	8.2E-01	---	---	8.2E-01
						Total Risk Across Sediment	**3.7E-05**					**Total Hazard Index Across Sediment**	**8.4E-01**
						Total Risk Across All Media and All Exposure Routes	**7.9E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.3E+00**

TABLE 6.9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	--	1.4E-07	--	1.4E-07	ARSENIC	Skin	--	7.4E-04	--	7.4E-04
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	--	2.1E-03	--	2.1E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	1.9E-05	--	1.9E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	1.1E-04	--	1.1E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	6.8E-07	--	6.8E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	4.1E-07	--	4.1E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	4.2E-06	--	4.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.3E-06	--	9.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	6.1E-07	--	6.1E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	1.5E-05	---	1.5E-05	(Total)		---	2.9E-03	---	2.9E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	2.1E-07	--	--	2.1E-07	ARSENIC	Skin	1.1E-03	--	--	1.1E-03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-01	--	--	1.2E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.5E-06	--	--	4.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.6E-06	--	--	1.6E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.6E-05	--	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.3E-05	--	--	2.3E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.3E-06	--	--	2.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	4.8E-05	---	---	4.8E-05	(Total for Finfish)		3.5E-01	---	---	3.5E-01
						Total Risk Across Surface Water	**6.4E-05**			**Total Hazard Index Across Surface Water**			**3.6E-01**

TABLE 6.9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.9E-08	--	1.9E-08	DIOXIN (TEQ)	Developmental	--	2.9E-04	--	2.9E-04
			METALS					**METALS**					
			ARSENIC	--	2.5E-07	--	2.5E-07	ARSENIC	Skin	--	1.3E-03	--	1.3E-03
			COBALT	--	--	--	NA	COBALT	Blood	--	7.9E-04	--	7.9E-04
			IRON	--	--	--	NA	IRON	None	--	4.7E-04	--	4.7E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair		8.6E-03	--	8.6E-03
			PAHS					**PAHS**		--			
			BENZO(A)ANTHRACENE	--	5.8E-08	--	5.8E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	9.2E-08	--	9.2E-08	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	5.3E-07	--	5.3E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	7.2E-08	--	7.2E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	4.2E-08	--	4.2E-08	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	7.6E-09	--	7.6E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	1.1E-06	---	1.1E-06		(Total)	---	1.1E-02	---	1.1E-02
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	3.4E-01	--	--	3.4E-01
			METALS					**METALS**					
			ARSENIC	6.5E-06	--	--	6.5E-06	ARSENIC	Skin	3.4E-02	--	--	3.4E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.1E-01	--	--	1.1E-01
			IRON	--	--	--	NA	IRON	None	3.2E-02	--	--	3.2E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.8E-01	--	--	1.8E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.8E-06	--	--	9.8E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.9E-06	--	--	4.9E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.4E-05	--	--	4.4E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.5E-05	--	--	1.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.7E-06	--	--	2.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	5.5E-05	--	--	5.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.6E-04	---	---	1.6E-04		(Total for Crabs)	6.9E-01	---	---	6.9E-01
						Total Risk Across Sediment	**1.6E-04**					**Total Hazard Index Across Sediment**	**7.1E-01**
						Total Risk Across All Media and All Exposure Routes	**2.2E-04**					**Total Hazard Index Across All Media and All Exposure Routes**	**1.1E+00**

TABLE 6.10.1

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	1.8E-05	--	1.8E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	3.1E-05	--	3.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	3.3E-06	--	3.3E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	2.4E-04	--	2.4E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	5.9E-04	--	5.9E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	3.7E-05	--	3.7E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	9.2E-04	---	9.2E-04	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.5E-01	--	--	1.5E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	2.6E-05	--	--	2.6E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	2.6E-05	--	--	2.6E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	2.7E-06	--	--	2.7E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.0E-04	--	--	2.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.2E-04	--	--	3.2E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.0E-05	--	--	3.0E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	6.0E-04	---	---	6.0E-04	(Total for Finfish)		1.5E-01	---	---	1.5E-01
							Total Risk Across Surface Water[1]						**Total Hazard Index Across Surface Water[1]**
							NA						**NA**

TABLE 6.10.1

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	1.7E-06	--	1.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			(Total)	---	1.7E-06	---	1.7E-06		(Total)	---	---	---	---
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-05	--	--	4.9E-05	DIOXIN (TEQ)	Developmental	8.8E-01	--	--	8.8E-01
			METALS					**METALS**					
			ARSENIC	1.4E-05	--	--	1.4E-05	ARSENIC	Skin	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Blood	1.4E-01	--	--	1.4E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.8E-01	--	--	1.8E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.2E-05	--	--	9.2E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	2.7E-05	--	--	2.7E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.1E-04	--	--	4.1E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.0E-04	--	--	2.0E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.8E-05	--	--	1.8E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	2.7E-01	--	--	2.7E-01
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.3E-04	--	--	2.3E-04	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.0E-03	---	---	1.0E-03		(Total for Crabs)	1.5E+00	---	---	1.5E+00
							Total Risk Across Sediment[1]						**Total Hazard Index Across Sediment[1]**
							NA						**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

1) Total carcinogenic risk and non-carcinogenic hazard are shown as "NA" because this table only presents chemicals that contribute snignificantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 6.9.1.

Total Hazard Index Across For Blood	**1.4E-01**
Total Hazard Index Across For Central Nervous System	**1.5E-01**
Total Hazard Index Across For Developmental System	**1.1E+00**
Total Hazard Index Across For Hair	**1.8E-01**

TABLE 6.10.2

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	2.1E-05	--	2.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	3.6E-05	--	3.6E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	3.8E-06	--	3.8E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	2.7E-04	--	2.7E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	6.8E-04	--	6.8E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	4.2E-05	--	4.2E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	1.1E-03	---	1.1E-03	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.7E-01	--	--	1.7E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.0E-05	--	--	3.0E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.0E-05	--	--	3.0E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.1E-06	--	--	3.1E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.3E-04	--	--	2.3E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.7E-04	--	--	3.7E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	--	--	3.5E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	7.0E-04	---	---	7.0E-04	(Total for Finfish)		2.8E-01	---	---	2.8E-01
						Total Risk Across Surface Water[1]	**NA**					**Total Hazard Index Across Surface Water[1]**	**NA**

TABLE 6.10.2

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	7.7E-06	--	7.7E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.5E-06	--	1.5E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	9.2E-06	---	9.2E-06		(Total)	---	---	---	---
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	1.0E+00	--	--	1.0E+00
			METALS					**METALS**					
			ARSENIC	5.3E-06	--	--	5.3E-06	ARSENIC	Skin	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Blood	1.6E-01	--	--	1.6E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.1E-01	--	--	2.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-04	--	--	1.1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.1E-05	--	--	3.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.7E-04	--	--	4.7E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.3E-04	--	--	2.3E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.0E-05	--	--	2.0E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.1E-01	--	--	3.1E-01
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	8.7E-05	--	--	8.7E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	9.7E-04	---	---	9.7E-04		(Total for Crabs)	1.7E+00	---	---	1.7E+00
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

1) Total carcinogenic risk and non-carcinogenic hazard are shown as "NA" because this table only presents chemicals that contribute snignificantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 6.9.2.

Total Hazard Index Across For Blood	**1.6E-01**
Total Hazard Index Across For Central Nervous System	**1.7E-01**
Total Hazard Index Across For Developmental System	**1.3E+00**
Total Hazard Index Across For Hair	**3.2E-01**
Total Hazard Index Across For Skin	**1.1E-01**

TABLE 6.10.3

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	7.7E-06	--	7.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.3E-05	--	1.3E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	1.4E-06	--	1.4E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.0E-04	--	1.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	2.5E-04	--	2.5E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.6E-05	--	1.6E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	3.9E-04	---	3.9E-04	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	2.1E-01	--	--	2.1E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.3E-01	--	--	1.3E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-05	--	--	1.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.1E-05	--	--	1.1E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	1.2E-06	--	--	1.2E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	8.6E-05	--	--	8.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.4E-04	--	--	1.4E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.3E-05	--	--	1.3E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	2.6E-04	---	---	---	(Total for Finfish)		4.7E-01	---	---	4.7E-01
			Total Risk Across Surface Water[1]				**NA**	**Total Hazard Index Across Surface Water[1]**					**NA**

TABLE 6.10.3

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	3.9E-06	--	3.9E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	--	--	NA	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	3.9E-06	---	3.9E-06		(Total)	---	---	---	---
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-06	--	--	7.0E-06	DIOXIN (TEQ)	Developmental	1.3E+00	--	--	1.3E+00
			METALS					**METALS**					
			ARSENIC	2.0E-06	--	--	2.0E-06	ARSENIC	Skin	1.0E-01	--	--	1.0E-01
			COBALT	--	--	--	NA	COBALT	Blood	2.0E-01	--	--	2.0E-01
			IRON	--	--	--	NA	IRON	None	1.0E-01	--	--	1.0E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.6E-01	--	--	2.6E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.0E-05	--	--	4.0E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.2E-05	--	--	1.2E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.8E-04	--	--	1.8E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	8.5E-05	--	--	8.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	7.7E-06	--	--	7.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.9E-01	--	--	3.9E-01
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	3.2E-05	--	--	3.2E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	3.6E-04	---	---	3.6E-04		(Total for Crabs)	2.3E+00	---	---	2.3E+00
							Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

1) Total carcinogenic risk and non-carcinogenic hazard are shown as "NA" because this table only presents chemicals that contribute snignificantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 6.9.2.

Total Hazard Index Across For Blood	**2.0E-01**
Total Hazard Index Across For Central Nervous System	**3.4E-01**
Total Hazard Index Across For Developmental System	**1.6E+00**
Total Hazard Index Across For Hair	**4.0E-01**
Total Hazard Index Across For Skin	**2.4E-01**
Total Hazard Index Across For Iron	**1.0E-01**

TABLE 6.10.4

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	9.5E-06	--	9.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.7E-05	--	1.7E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	--	1.7E-06	--	1.7E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.3E-04	--	1.3E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.1E-04	--	3.1E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.9E-05	--	1.9E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	4.8E-04	---	4.8E-04	(Total)		---	---	---	---
	Finfish	Coke Point	**METALS**					**METALS**					
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.1E-01	--	--	1.1E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.8E-01	--	--	1.8E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.1E-05	--	--	3.1E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.2E-05	--	--	3.2E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.3E-06	--	--	3.3E-06	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.4E-04	--	--	2.4E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.9E-04	--	--	3.9E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.7E-05	--	--	3.7E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	7.4E-04	---	---	7.4E-04	(Total for Finfish)		4.0E-01	---	---	4.0E-01
			Total Risk Across Surface Water[1]				**NA**	**Total Hazard Index Across Surface Water[1]**					**NA**

TABLE 6.10.4

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

COKE POINT OFFSHORE AREA

Location: Coke Point Offshore Area

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Coke Point	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	6.1E-06	--	6.1E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.2E-06	--	1.2E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	7.3E-06	---	7.3E-06		(Total)	---	---	---	---
	Crabs	Coke Point	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	6.0E-05	--	--	6.0E-05	DIOXIN (TEQ)	Developmental	1.1E+00	--	--	1.1E+00
			METALS					**METALS**					
			ARSENIC	1.7E-05	--	--	1.7E-05	ARSENIC	Skin	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Blood	1.7E-01	--	--	1.7E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.2E-01	--	--	2.2E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.1E-04	--	--	1.1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.3E-05	--	--	3.3E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.0E-04	--	--	5.0E-04	BENZO(A)PYRENE	NA	--	--	--	NA
			CHRYSENE	1.0E-06	--	--	1.0E-06	CHRYSENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.4E-04	--	--	2.4E-04	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.2E-05	--	--	2.2E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Developmental System	3.3E-01	--	--	3.3E-01
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.8E-04	--	--	2.8E-04	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.3E-03	---	---	1.3E-03		(Total for Crabs)	1.8E+00	---	---	1.8E+00
							Total Risk Across Sediment[1]						**Total Hazard Index Across Sediment[1]**
							NA						**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

1) Total carcinogenic risk and non-carcinogenic hazard are shown as "NA" because this table only presents chemicals that contribute snignificantly to risk results. Total carcinogenic risks and non-carcinogenic hazards can be found on Table 6.9.2.

Total Hazard Index Across For Blood	**1.7E-01**
Total Hazard Index Across For Central Nervous System	**2.9E-01**
Total Hazard Index Across For Developmental System	**1.4E+00**
Total Hazard Index Across For Hair	**3.4E-01**
Total Hazard Index Across For Skin	**1.1E-01**

Table 6.10.5

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	2.6E-06	--	2.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.6E-06	--	1.6E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.6E-05	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.5E-05	--	3.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	2.3E-06	--	2.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	5.8E-05	---	5.8E-05		(Total)	---	---	---	---
	Finfish	Patapsco River	**METALS**	--				**METALS**		--			
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.0E-01	--	--	1.0E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.0E-01	--	--	1.0E-01
	Finfish	Patapsco River	**PAHS**	--				**PAHS**		--			
			BENZO(A)ANTHRACENE	3.7E-06	--	--	3.7E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.3E-06	--	--	1.3E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.3E-05	--	--	1.3E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.9E-05	--	--	1.9E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.9E-06	--	--	1.9E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	3.9E-05	---	---	3.9E-05		(Total for Finfish)	2.0E-01	---	---	2.0E-01
							Total Risk Across Surface Water[1]						**Total Hazard Index Across Surface Water[1]**
							NA						**NA**

Table 6.10.5

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.5E-05	--	--	1.5E-05	DIOXIN (TEQ)	Developmental	2.8E-01	--	--	2.8E-01
			METALS					**METALS**		--			
			ARSENIC	5.4E-06	--	--	5.4E-06	ARSENIC	Skin	--	--	--	NA
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.5E-01	--	--	1.5E-01
			PAHS					**PAHS**		--			
			BENZO(A)ANTHRACENE	8.1E-06	--	--	8.1E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.1E-06	--	--	4.1E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.6E-05	--	--	3.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.2E-05	--	--	1.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.2E-06	--	--	2.2E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**		--			
			TOTAL PCB's	4.5E-05	--	--	4.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.3E-04	---	---	1.3E-04	(Total for Crabs)		4.2E-01	---	---	4.2E-01
						Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Central Nervous System	**2.0E-01**
Total Hazard Index Across For Developmental System	**2.8E-01**
Total Hazard Index Across For Hair	**1.5E-01**

Table 6.10.6

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	3.0E-06	--	3.0E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.8E-06	--	1.8E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	1.8E-05	--	1.8E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	4.1E-05	--	4.1E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	2.7E-06	--	2.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	6.7E-05	---	6.7E-05	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**	--				**METALS**		--			
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-01	--	--	1.2E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.0E-01	--	--	1.0E-01
			PAHS	--				**PAHS**		--			
			BENZO(A)ANTHRACENE	4.2E-06	--	--	4.2E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.5E-06	--	--	1.5E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.5E-05	--	--	1.5E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.2E-05	--	--	2.2E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.2E-06	--	--	2.2E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	4.5E-05	---	---	4.5E-05	(Total for Finfish)		3.3E-01	---	---	3.3E-01
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**

Table 6.10.6

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	5.9E-06	--	--	5.9E-06	DIOXIN (TEQ)	Developmental	3.2E-01	--	--	3.2E-01
			METALS					**METALS**					
			ARSENIC	2.1E-06	--	--	2.1E-06	ARSENIC	Skin	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Blood	1.1E-01	--	--	1.1E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.7E-01	--	--	1.7E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.3E-06	--	--	9.3E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.7E-06	--	--	4.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.2E-05	--	--	4.2E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.4E-05	--	--	1.4E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.5E-06	--	--	2.5E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.7E-05	--	--	1.7E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	9.7E-05	---	---	9.7E-05		(Total for Crabs)	5.9E-01	---	---	5.9E-01
							Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Blood	**1.1E-01**
Total Hazard Index Across For Central Nervous System	**2.3E-01**
Total Hazard Index Across For Developmental System	**3.2E-01**
Total Hazard Index Across For Hair	**2.7E-01**
Total Hazard Index Across For Skin	**1.0E-01**

1) Total carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risk and non-carcinogenic hazards can be found on Table 6.9.6.

Table 6.10.7

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)ANTHRACENE	--	1.1E-06	--	1.1E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	6.8E-06	--	6.8E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.5E-05	--	1.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	2.3E-05	---	2.3E-05	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**	--				**METALS**		--			
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.4E-01	--	--	1.4E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.5E-01	--	--	1.5E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.3E-01	--	--	1.3E-01
			PAHS	--				**PAHS**		--			
			BENZO(A)ANTHRACENE	1.6E-06	--	--	1.6E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.8E-06	--	--	5.8E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	8.3E-06	--	--	8.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total for Finfish)	1.6E-05	---	---	1.6E-05	(Total for Finfish)		4.2E-01	---	---	4.2E-01
						Total Risk Across Surface Water[1]	**NA**			**Total Hazard Index Across Surface Water[1]**			**NA**

Table 6.10.7

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	2.2E-06	--	--	2.2E-06	DIOXIN (TEQ)	Developmental	4.0E-01	--	--	4.0E-01
			METALS					**METALS**					
			COBALT	--	--	--	NA	COBALT	Blood	1.3E-01	--	--	1.3E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.1E-01	--	--	2.1E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.5E-06	--	--	3.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.7E-06	--	--	1.7E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.6E-05	--	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	5.1E-06	--	--	5.1E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	6.5E-06	--	--	6.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	3.5E-05	---	---	3.5E-05		(Total for Crabs)	7.4E-01	---	---	7.4E-01
							Total Risk Across Sediment[1]	**NA**					**Total Hazard Index Across Sediment[1]**	**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Blood	**1.3E-01**
Total Hazard Index Across For Central Nervous System	**2.9E-01**
Total Hazard Index Across For Developmental System	**4.0E-01**
Total Hazard Index Across For Hair	**3.4E-01**
Total Hazard Index Across For Skin	**1.3E-01**

1) Total carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risk and non-carcinogenic hazards can be found on Table 6.9.7.

Table 6.10.8

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**PAHS**					**PAHS**					
			BENZO(A)PYRENE	--	4.2E-06	--	4.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	9.3E-06	--	9.3E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			(Total)	---	1.4E-05	---	1.4E-05	(Total)		---	---	---	---
	Finfish	Patapsco River	**METALS**					**METALS**					
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.2E-01	--	--	1.2E-01
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-01	--	--	1.2E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	1.1E-01	--	--	1.1E-01
			PAHS	--				**PAHS**					
			BENZO(A)ANTHRACENE	4.5E-06	--	--	4.5E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.6E-06	--	--	1.6E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.6E-05	--	--	1.6E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.3E-05	--	--	2.3E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.3E-06	--	--	2.3E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	4.8E-05	---	---	4.8E-05	(Total for Finfish)		3.5E-01	---	---	3.5E-01
						Total Risk Across Surface Water[1]	**NA**					**Total Hazard Index Across Surface Water[1]**	**NA**

Table 6.10.8

SUMMARY OF SIGNIFICANT CONTRIBUTORS TO RISK

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-05	--	--	1.9E-05	DIOXIN (TEQ)	Developmental	3.4E-01	--	--	3.4E-01
			METALS					**METALS**					
			ARSENIC	6.5E-06	--	--	6.5E-06	ARSENIC	Skin	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Blood	1.1E-01	--	--	1.1E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.8E-01	--	--	1.8E-01
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	9.8E-06	--	--	9.8E-06	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.9E-06	--	--	4.9E-06	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.4E-05	--	--	4.4E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.5E-05	--	--	1.5E-05	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.7E-06	--	--	2.7E-06	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	5.5E-05	--	--	5.5E-05	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.6E-04	---	---	1.6E-04	(Total for Crabs)		6.3E-01	---	---	6.3E-01
							Total Risk Across Sediment[1]						**Total Hazard Index Across Sediment[1]**
							NA						**NA**

Note: Significant contributors to risk defined per USEPA guidance (USEPA 2002) as those with a carcinogenic risk of 1E-6 or greater or a hazard quotient of 0.1 or greater.

Total Hazard Index Across For Blood	**1.1E-01**
Total Hazard Index Across For Central Nervous System	**2.5E-01**
Total Hazard Index Across For Developmental System	**3.4E-01**
Total Hazard Index Across For Hair	**2.9E-01**
Total Hazard Index Across For Skin	**1.1E-01**

1) Total carcinogenic risk and non-carcinogenic hazards are shown as "NA" because this table only presents chemicals that contribute significantly to risk results. Total carcinogenic risk and non-carcinogenic hazards can be found on Table 6.9.8.

APPENDIX A

GROUPINGS AND SAMPLES USED

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Coke Point Offshore Area	BH-SED-01	BH-SED-01-00_09	563434.1	1455328	Sediment
		BH-SED-01-00_10			Sediment
Coke Point Offshore Area	BH-SED-02	BH-SED-02-00_09	563005.1	1454150	Sediment
		BH-SED-02-00_10			Sediment
Coke Point Offshore Area	BH-SED-03A	BH-SED-03A-00_09	562223.9	1453744	Sediment
Coke Point Offshore Area	BH-SED-03B	BH-SED-03B-00_09	562198.2	1453645	Sediment
		BH-SED-03B-00_10			
Coke Point Offshore Area	BH-SED-03C	BH-SED-03C-00_09	562223.3	1453539	Sediment
Coke Point Offshore Area	BH-SED-03D	BH-SED-03D-00_10	562166.2	1453284	Sediment
Coke Point Offshore Area	BH-SED-03F	BH-SED-03F-00_10	562002.9	1452419	Sediment
Coke Point Offshore Area	BH-SED-04	BH-SED-04-00_09	561514.5	1454100	Sediment
		BH-SED-04-00_10			
Coke Point Offshore Area	BH-SED-05	BH-SED-05-00_09	561501.4	1454975	Sediment
Coke Point Offshore Area	BH-SED-06	BH-SED-06-00_09	560610.3	1454339	Sediment
		BH-SED-06-00_10			Sediment
Coke Point Offshore Area	BH-SED-06B	BH-SED-06B-00_10	560341.7	1453865	Sediment
Coke Point Offshore Area	BH-SED-06C	BH-SED-06C-00_10	560065	1453131	Sediment
Coke Point Offshore Area	BH-SED-06D	BH-SED-06D-00_10	559716.4	1452406	Sediment
Coke Point Offshore Area	BH-SED-07	BH-SED-07-00_09	559977.6	1454829	Sediment
Coke Point Offshore Area	BH-SED-08	BH-SED-08-00_09	559401.1	1455395	Sediment
Coke Point Offshore Area	BH-SED-09	BH-SED-09-00_09	559693.4	1456420	Sediment
Coke Point Offshore Area	BH-SED-09B	BH-SED-09B-00_10	558628.9	1456524	Sediment
Coke Point Offshore Area	BH-SED-10	BH-SED-10-00_09	559612	1457598	Sediment
		BH-SED-10-00_10			Sediment
Coke Point Offshore Area	BH-SED-10B	BH-SED-10B-00_10	558540.9	1457534	Sediment
Coke Point Offshore Area	BH-SED-11	BH-SED-11-00_09	560117.9	1458339	Sediment
		BH-SED-11-00_10			Sediment
Coke Point Offshore Area	BH-SED-12	BH-SED-12-00_09	561186	1458356	Sediment
Coke Point Offshore Area	BH-SED-13A	BH-SED-13A-00_09	562005.3	1458136	Sediment
Coke Point Offshore Area	BH-SED-13B	BH-SED-13B-00_09	562042.6	1458157	Sediment
		BH-SED-13B-00_10			Sediment
Coke Point Offshore Area	BH-SED-13C	BH-SED-13C-00_09	562169.2	1458141	Sediment
Coke Point Offshore Area	BH-SED-14	BH-SED-14-00_09	562720.8	1458292	Sediment
Coke Point Offshore Area	BH-SED-16	BH-SED-16-00_10	562932.5	1453179	Sediment
Coke Point Offshore Area	BH-SED-19	BH-SED-19-00_10	562201	1458677	Sediment
Coke Point Offshore Area	BH-SED-20	BH-SED-20-00_10	561503.3	1458756	Sediment
Coke Point Offshore Area	BH-SED-21	BH-SED-21-00_10	558556.3	1460089	Sediment
Coke Point Offshore Area	S-B1	S-B1	561991.6	1453272	Sediment
Coke Point Offshore Area	S-B2	S-B2	559850.8	1454247	Sediment
Coke Point Offshore Area	S-B3	S-B3	559229.2	1457613	Sediment
Coke Point Offshore Area	S-B4	S-B4	561198.4	1458350	Sediment
Coke Point Offshore Area	SP09-01	SP09-01	559724.1	1458007	Sediment

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Coke Point Offshore Area	SP09-02	SP09-02	559564.5	1458579	Sediment
Coke Point Offshore Area	SP09-03	SP09-03	559304.6	1458036	Sediment
Coke Point Offshore Area	SP09-04	SP09-04	559046.1	1458582	Sediment
Coke Point Offshore Area	SP09-05	SP09-05	558575	1458391	Sediment
Coke Point Offshore Area	SP09-06	SP09-06	557909.9	1458552	Sediment
Coke Point Offshore Area	BH-W-01	BH-W-01-D_09	563423.1	1455326	Surface Water
		BH-W-01-M_09			Surface Water
		BH-W-01-S_09			Surface Water
Coke Point Offshore Area	BH-W-02	BH-W-02-D_09	563017.7	1454166	Surface Water
		BH-W-02-D_10			Surface Water
		BH-W-02-M_09			Surface Water
		BH-W-02-M_10			Surface Water
		BH-W-02-S_09			Surface Water
		BH-W-02-S_10			Surface Water
Coke Point Offshore Area	BH-W-03A	BH-W-03A-D_09	562223.9	1453744	Surface Water
		BH-W-03A-M_09			Surface Water
		BH-W-03A-S_09			Surface Water
Coke Point Offshore Area	BH-W-03B	BH-W-03B-D_10	562217.2	1453681	Surface Water
		BH-W-03B-M_10			Surface Water
		BH-W-03B-S_10			Surface Water
		BH-W-03B-D_09			Surface Water
		BH-W-03B-M_09			Surface Water
		BH-W-03B-S_09			Surface Water
Coke Point Offshore Area	BH-W-03C	BH-W-03C-D_09	562223.3	1453539	Surface Water
		BH-W-03C-M_09			Surface Water
		BH-W-03C-S_09			Surface Water
Coke Point Offshore Area	BH-W-03D	BH-W-03D-D_10	562168.5	1453293	Surface Water
		BH-W-03D-M_10			Surface Water
		BH-W-03D-S_10			Surface Water
Coke Point Offshore Area	BH-W-03F	BH-W-03F-D_10	561962.1	1452376	Surface Water
		BH-W-03F-M_10			Surface Water
		BH-W-03F-S_10			Surface Water
Coke Point Offshore Area	BH-W-04	BH-W-04-D_10	561520.1	1454086	Surface Water
		BH-W-04-M_10			Surface Water
		BH-W-04-S_10			Surface Water
		BH-W-04-D_09			Surface Water
		BH-W-04-M_09			Surface Water
		BH-W-04-S_09			Surface Water
Coke Point Offshore Area	BH-W-05	BH-W-05-D_09	561501.4	1454975	Surface Water
		BH-W-05-M_09			Surface Water
		BH-W-05-S_09			Surface Water

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Coke Point Offshore Area	BH-W-06	BH-W-06-M_10	560619.9	1454343	Surface Water
		BH-W-06-D_10			Surface Water
		BH-W-06-S_10			Surface Water
		BH-W-06-D_09			Surface Water
		BH-W-06-M_09			Surface Water
		BH-W-06-S_09			Surface Water
Coke Point Offshore Area	BH-W-06B	BH-W-06B-D_10	560398	1453869	Surface Water
		BH-W-06B-M_10			Surface Water
		BH-W-06B-S_10			Surface Water
Coke Point Offshore Area	BH-W-06C	BH-W-06C-D_10	560063.7	1453138	Surface Water
		BH-W-06C-M_10			Surface Water
		BH-W-06C-S_10			Surface Water
Coke Point Offshore Area	BH-W-06D	BH-W-06D-D_10	559679.9	1452408	Surface Water
		BH-W-06D-M_10			Surface Water
		BH-W-06D-S_10			Surface Water
Coke Point Offshore Area	BH-W-07	BH-W-07-D_09	559977.6	1454829	Surface Water
		BH-W-07-M_09			Surface Water
		BH-W-07-S_09			Surface Water
Coke Point Offshore Area	BH-W-08	BH-W-08-D_09	559401.1	1455395	Surface Water
		BH-W-08-M_09			Surface Water
		BH-W-08-S_09			Surface Water
Coke Point Offshore Area	BH-W-09	BH-W-09-D_09	559693.4	1456420	Surface Water
		BH-W-09-M_09			Surface Water
		BH-W-09-S_09			Surface Water
Coke Point Offshore Area	BH-W-09B	BH-W-09B-D_10	558615.8	1456582	Surface Water
		BH-W-09B-M_10			Surface Water
		BH-W-09B-S_10			Surface Water
Coke Point Offshore Area	BH-W-10	BH-W-10-M_10	559629.1	1457583	Surface Water
		BH-W-10-S_10			Surface Water
		BH-W-10-D_09			Surface Water
		BH-W-10-D_10			Surface Water
		BH-W-10-M_09			Surface Water
		BH-W-10-S_09			Surface Water
Coke Point Offshore Area	BH-W-10B	BH-W-10B-D_10	558565.7	1457524	Surface Water
		BH-W-10B-M_10			Surface Water
		BH-W-10B-S_10			Surface Water
Coke Point Offshore Area	BH-W-11	BH-W-11-D_09	560106.7	1458348	Surface Water
		BH-W-11-D_10			Surface Water
		BH-W-11-M_09			Surface Water
		BH-W-11-M_10			Surface Water
		BH-W-11-S_09			Surface Water
		BH-W-11-S_10			Surface Water

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Coke Point Offshore Area	BH-W-12	BH-W-12-D_09	561186	1458356	Surface Water
		BH-W-12-M_09			Surface Water
		BH-W-12-S_09			Surface Water
Coke Point Offshore Area	BH-W-13	BH-W-13B-D_09	562005.3	1458136	Surface Water
		BH-W-13B-M_09			Surface Water
		BH-W-13B-S_09			Surface Water
		BH-W-13C-D_09			Surface Water
		BH-W-13C-M_09			Surface Water
		BH-W-13C-S_09			Surface Water
Coke Point Offshore Area	BH-W-13A	BH-W-13A-D_09	562005.3	1458136	Surface Water
		BH-W-13A-M_09			Surface Water
		BH-W-13A-S_09			Surface Water
Coke Point Offshore Area	BH-W-13B	BH-W-13B-D_10	562022.9	1458169	Surface Water
		BH-W-13B-M_10			Surface Water
		BH-W-13B-S_10			Surface Water
Coke Point Offshore Area	BH-W-14	BH-W-14-D_09	562720.8	1458292	Surface Water
		BH-W-14-M_09			Surface Water
		BH-W-14-S_09			Surface Water
Coke Point Offshore Area	BH-W-19	BH-W-19-D_10	562155.5	1458718	Surface Water
		BH-W-19-M_10			Surface Water
		BH-W-19-S_10			Surface Water
Coke Point Offshore Area	BH-W-20	BH-W-20-D_10	561483.6	1458758	Surface Water
		BH-W-20-M_10			Surface Water
		BH-W-20-S_10			Surface Water
Coke Point Offshore Area	BH-W-21	BH-W-21-D_10	558315	1459379	Surface Water
		BH-W-21-M_10			Surface Water
		BH-W-21-S_10			Surface Water
Coke Point Offshore Area	--	AT0-649A-W	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649A-W DUP	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649B-W	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649C-W	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649D-W	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649E-W	--	--	Worm Tissue
Coke Point Offshore Area	--	AT0-649A-C	--	--	Clam Tissue
Coke Point Offshore Area	--	AT0-649A-C DUP	--	--	Clam Tissue
Coke Point Offshore Area	--	AT0-649B-C	--	--	Clam Tissue
Coke Point Offshore Area	--	AT0-649C-C	--	--	Clam Tissue
Coke Point Offshore Area	--	AT0-649D-C	--	--	Clam Tissue
Coke Point Offshore Area	--	AT0-649E-C	--	--	Clam Tissue

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Coke Point Offshore Area	--	CP-CASA-MT-A	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MT-B	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MT-C	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MT-D	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MT-E	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MU-A	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MU-B	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MU-C	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MU-D	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-CASA-MU-E	--	--	Crab Tissue
Coke Point Offshore Area	--	CP-MOAM-FT-A	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-FT-B	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-FT-C	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-FT-D	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-FT-E	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-WB-A	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-WB-B	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-WB-C	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-WB-D	--	--	Fish Tissue
Coke Point Offshore Area	--	CP-MOAM-WB-E	--	--	Fish Tissue
Patapsco River Background	EH2	EH2	567745.9	1450131	Sediment
Patapsco River Background	EH3	EH3	568427.5	1448333	Sediment
Patapsco River Background	EH4	EH4	570716.6	1448679	Sediment
Patapsco River Background	BKGD-SED-01	BKGD-SED-01-00_10	565832	1448001	Sediment
Patapsco River Background	BKGD-SED-02	BKGD-SED-02-00_10	554907.5	1453055	Sediment
Patapsco River Background	BKGD-SED-03	BKGD-SED-03-00_10	552853.1	1461608	Sediment
Patapsco River Background	BKGD-W-01	BKGD-W-01-S_10	565862.1	1448022	Surface Water
		BKGD-W-01-D_10	565862.1	1448022	Surface Water
		BKGD-W-01-M_10			Surface Water
Patapsco River Background	BKGD-W-02	BKGD-W-02-S_10	554850.8	1453060	Surface Water
		BKGD-W-02-D_10			Surface Water
		BKGD-W-02-M_10			Surface Water
Patapsco River Background	BKGD-W-03	BKGD-W-03-D_10	552861.5	1461629	Surface Water
		BKGD-W-03-M_10			Surface Water
		BKGD-W-03-S_10			Surface Water
Patapsco River Background	--	AT0-650A-C	--	--	Clam Tissue
Patapsco River Background	--	AT0-650B-C	--	--	Clam Tissue
Patapsco River Background	--	AT0-650C-C	--	--	Clam Tissue
Patapsco River Background	--	AT0-650D-C	--	--	Clam Tissue
Patapsco River Background	--	AT0-650E-C	--	--	Clam Tissue
Patapsco River Background	--	AT0-650A-W	--	--	Worm Tissue
Patapsco River Background	--	AT0-650B-W	--	--	Worm Tissue
Patapsco River Background	--	AT0-650C-W	--	--	Worm Tissue

APPENDIX A
GROUPINGS AND SAMPLES USED IN THE RISK ASSESSMENT OF THE COKE POINT OFFSHORE AREA

Group	Sample Location	Sample Name	Northing	Easting	Aquatic Media
Patapsco River Background	--	AT0-650D-W	--	--	Worm Tissue
Patapsco River Background	--	AT0-650E-W	--	--	Worm Tissue
Patapsco River Background	--	PR-CASA-MT-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MT-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MT-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MT-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MT-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MU-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MU-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MU-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MU-A	--	--	Crab Tissue
Patapsco River Background	--	PR-CASA-MU-A	--	--	Crab Tissue
Patapsco River Background	--	PR-MOAM-FT-A	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-FT-B	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-FT-C	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-FT-D	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-FT-E	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-WB-A	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-WB-B	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-WB-C	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-WB-D	--	--	Fish Tissue
Patapsco River Background	--	PR-MOAM-WB-E	--	--	Fish Tissue
Bioaccumulation Test Control	--	AT0-682A-W	--	--	Worm Tissue
Bioaccumulation Test Control	--	AT0-682B-W	--	--	Worm Tissue
Bioaccumulation Test Control	--	AT0-682C-W	--	--	Worm Tissue
Bioaccumulation Test Control	--	AT0-683A-C	--	--	Clam Tissue
Bioaccumulation Test Control	--	AT0-683B-C	--	--	Clam Tissue
Bioaccumulation Test Control	--	AT0-683C-C	--	--	Clam Tissue
Bioaccumulation Test Pretest	--	PRETEST A - C	--	--	Clam Tissue
Bioaccumulation Test Pretest	--	PRETEST B - C	--	--	Clam Tissue
Bioaccumulation Test Pretest	--	PRETEST C - C	--	--	Clam Tissue
Bioaccumulation Test Pretest	--	PRETEST A - W	--	--	Worm Tissue
Bioaccumulation Test Pretest	--	PRETEST B - W	--	--	Worm Tissue
Bioaccumulation Test Pretest	--	PRETEST C - W	--	--	Worm Tissue

APPENDIX B:

COKE POINT PROUCL OUTPUTS

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COKE POINT OFFSHORE AREA PROUCL OUTPUT

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_1-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1-METHYLNAPHTHALENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	30

Raw Statistics		Log-transformed Statistics	
Minimum	0.015	Minimum of Log Data	-4.2
Maximum	3.3	Maximum of Log Data	1.194
Mean	0.654	Mean of log Data	-1.219
Median	0.19	SD of log Data	1.33
SD	0.842		
Coefficient of Variation	1.288		
Skewness	1.776		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.731	Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.888	95% H-UCL	1.327
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.501
95% Adjusted-CLT UCL	0.925	97.5% Chebyshev (MVUE) UCL	1.853
95% Modified-t UCL	0.895	99% Chebyshev (MVUE) UCL	2.546

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.71	Data appear Lognormal at 5% Significance Level
Theta Star	0.921	
MLE of Mean	0.654	
MLE of Standard Deviation	0.776	
nu star	52.53	
Approximate Chi Square Value (.05)	36.88	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 0.882
Adjusted Chi Square Value	36.31	95% Jackknife UCL 0.888
		95% Standard Bootstrap UCL 0.878
Anderson-Darling Test Statistic	1.283	95% Bootstrap-t UCL 0.954
Anderson-Darling 5% Critical Value	0.788	95% Hall's Bootstrap UCL 0.917
Kolmogorov-Smirnov Test Statistic	0.225	95% Percentile Bootstrap UCL 0.894
Kolmogorov-Smirnov 5% Critical Value	0.151	95% BCA Bootstrap UCL 0.931
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.258
		97.5% Chebyshev(Mean, Sd) UCL 1.519
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.032
95% Approximate Gamma UCL	0.932	
95% Adjusted Gamma UCL	0.946	

Potential UCL to Use		Use 95% H-UCL	1.327

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_1234678-HPCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDD

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	24

Raw Statistics

Minimum	0.00003
Maximum	0.0023
Mean	0.0002724
Median	0.00015
SD	0.0004517
Coefficient of Variation	1.658
Skewness	3.849

Log-transformed Statistics

Minimum of Log Data	-10.41
Maximum of Log Data	-6.075
Mean of log Data	-8.841
SD of log Data	1.05

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.509
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.953
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.0004207

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.0004842
95% Modified-t UCL	0.0004314

Assuming Lognormal Distribution

95% H-UCL	0.0004281
95% Chebyshev (MVUE) UCL	0.0004914
97.5% Chebyshev (MVUE) UCL	0.0005986
99% Chebyshev (MVUE) UCL	0.0008091

Gamma Distribution Test

k star (bias corrected)	0.844
Theta Star	0.0003228
MLE of Mean	0.0002724
MLE of Standard Deviation	0.0002965
nu star	45.56
Approximate Chi Square Value (.05)	31.08
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	30.31
Anderson-Darling Test Statistic	1.276
Anderson-Darling 5% Critical Value	0.777
Kolmogorov-Smirnov Test Statistic	0.217
Kolmogorov-Smirnov 5% Critical Value	0.174

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.0003993
95% Adjusted Gamma UCL	0.0004094

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.0004154
95% Jackknife UCL	0.0004207
95% Standard Bootstrap UCL	0.00041
95% Bootstrap-t UCL	0.0006592
95% Hall's Bootstrap UCL	0.0009182
95% Percentile Bootstrap UCL	0.0004276
95% BCA Bootstrap UCL	0.0005033
95% Chebyshev(Mean, Sd) UCL	0.0006513
97.5% Chebyshev(Mean, Sd) UCL	0.0008153
99% Chebyshev(Mean, Sd) UCL	0.00114

Potential UCL to Use	Use 95% H-UCL 0.0004281

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_1234678-HPCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDF

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	26

Raw Statistics

Minimum	0.000003
Maximum	0.00021
Mean	4.481E-05
Median	2.915E-05
SD	5.32E-05
Coefficient of Variation	N/A
Skewness	2.165

Log-transformed Statistics

Minimum of Log Data	-12.72
Maximum of Log Data	-8.468
Mean of log Data	-10.57
SD of log Data	1.099

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.705
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.976
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.227E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6.621E-05
95% Modified-t UCL	6.299E-05

Assuming Lognormal Distribution

95% H-UCL	8.329E-05
95% Chebyshev (MVUE) UCL	9.422E-05
97.5% Chebyshev (MVUE) UCL	0.0001153
99% Chebyshev (MVUE) UCL	0.0001568

Gamma Distribution Test

k star (bias corrected)	0.944
Theta Star	4.747E-05
MLE of Mean	4.481E-05
MLE of Standard Deviation	4.612E-05
nu star	50.98
Approximate Chi Square Value (.05)	35.58
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	34.76
Anderson-Darling Test Statistic	0.552
Anderson-Darling 5% Critical Value	0.773
Kolmogorov-Smirnov Test Statistic	0.122
Kolmogorov-Smirnov 5% Critical Value	0.173

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.42E-05
95% Adjusted Gamma UCL	6.572E-05

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	6.165E-05
95% Jackknife UCL	6.227E-05
95% Standard Bootstrap UCL	6.13E-05
95% Bootstrap-t UCL	7.286E-05
95% Hall's Bootstrap UCL	7.316E-05
95% Percentile Bootstrap UCL	6.282E-05
95% BCA Bootstrap UCL	6.643E-05
95% Chebyshev(Mean, Sd) UCL	8.944E-05
97.5% Chebyshev(Mean, Sd) UCL	0.0001088
99% Chebyshev(Mean, Sd) UCL	0.0001467

Potential UCL to Use

Use 95% Approximate Gamma UCL 6.42E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123478-HXCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,7,8-HXCDD

General Statistics

Number of Valid Data	27	Number of Detected Data	21
Number of Distinct Detected Data	17	Number of Non-Detect Data	6
		Percent Non-Detects	22.22%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.9E-07	Minimum Detected	-14.76
Maximum Detected	0.000008	Maximum Detected	-11.74
Mean of Detected	2.527E-06	Mean of Detected	-13.24
SD of Detected	2.327E-06	SD of Detected	0.855
Minimum Non-Detect	0.0000029	Minimum Non-Detect	-12.75
Maximum Non-Detect	0.0000081	Maximum Non-Detect	-11.72

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	27
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.761	Shapiro Wilk Test Statistic	0.952
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.575E-06	Mean	-13.16
SD	2.106E-06	SD	0.79
95% DL/2 (t) UCL	3.266E-06	95% H-Stat (DL/2) UCL	6.538E-06
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-13.28
		SD in Log Scale	0.756
		Mean in Original Scale	2.291E-06
		SD in Original Scale	2.091E-06
		95% Percentile Bootstrap UCL	2.988E-06
		95% BCA Bootstrap UCL	3.078E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.376	Data appear Lognormal at 5% Significance Level
Theta Star	1.836E-06	
nu star	57.81	
A-D Test Statistic	0.776	**Nonparametric Statistics**
5% A-D Critical Value	0.758	Kaplan-Meier (KM) Method
K-S Test Statistic	0.758	Mean 2.35E-06
5% K-S Critical Value	0.193	SD 2.129E-06
Data not Gamma Distributed at 5% Significance Level		SE of Mean 4.395E-07
		95% KM (t) UCL 0.0000031
Assuming Gamma Distribution		95% KM (z) UCL 3.073E-06
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 3.099E-06
Minimum	3.9E-07	95% KM (bootstrap t) UCL 3.397E-06
Maximum	0.000008	95% KM (BCA) UCL 3.107E-06
Mean	2.546E-06	95% KM (Percentile Bootstrap) UCL 3.102E-06
Median	2.115E-06	95% KM (Chebyshev) UCL 4.266E-06
SD	2.044E-06	97.5% KM (Chebyshev) UCL 5.095E-06
k star	1.779	99% KM (Chebyshev) UCL 6.724E-06
Theta star	1.431E-06	
Nu star	96.07	Potential UCLs to Use
AppChi2	74.46	95% KM (BCA) UCL 3.107E-06
95% Gamma Approximate UCL	3.285E-06	
95% Adjusted Gamma UCL	3.34E-06	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123478-HXCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,7,8-HXCDF

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	23

Raw Statistics

Minimum	9.6E-07
Maximum	0.000036
Mean	1.117E-05
Median	0.0000087
SD	9.649E-06
Coefficient of Variation	N/A
Skewness	1.294

Log-transformed Statistics

Minimum of Log Data	-13.86
Maximum of Log Data	-10.23
Mean of log Data	-11.79
SD of log Data	0.953

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.845
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.434E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.472E-05
95% Modified-t UCL	1.441E-05

Assuming Lognormal Distribution

95% H-UCL	1.898E-05
95% Chebyshev (MVUE) UCL	2.23E-05
97.5% Chebyshev (MVUE) UCL	2.688E-05
99% Chebyshev (MVUE) UCL	3.588E-05

Gamma Distribution Test

k star (bias corrected)	1.31
Theta Star	8.524E-06
MLE of Mean	1.117E-05
MLE of Standard Deviation	9.758E-06
nu star	70.77
Approximate Chi Square Value (.05)	52.4
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	51.39
Anderson-Darling Test Statistic	0.321
Anderson-Darling 5% Critical Value	0.764
Kolmogorov-Smirnov Test Statistic	0.0923
Kolmogorov-Smirnov 5% Critical Value	0.172

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.509E-05
95% Adjusted Gamma UCL	1.538E-05

Nonparametric Statistics

95% CLT UCL	1.422E-05
95% Jackknife UCL	1.434E-05
95% Standard Bootstrap UCL	1.417E-05
95% Bootstrap-t UCL	1.512E-05
95% Hall's Bootstrap UCL	1.48E-05
95% Percentile Bootstrap UCL	1.424E-05
95% BCA Bootstrap UCL	1.465E-05
95% Chebyshev(Mean, Sd) UCL	1.926E-05
97.5% Chebyshev(Mean, Sd) UCL	2.277E-05
99% Chebyshev(Mean, Sd) UCL	2.965E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.509E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_1234789-HPCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,7,8,9-HPCDF

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	21	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.8E-07	Minimum Detected	-15.09
Maximum Detected	0.00002	Maximum Detected	-10.82
Mean of Detected	5.738E-06	Mean of Detected	-12.51
SD of Detected	5.245E-06	SD of Detected	1.031
Minimum Non-Detect	0.000005	Minimum Non-Detect	-12.21
Maximum Non-Detect	0.0000071	Maximum Non-Detect	-11.86

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	19
Number treated as Detected	8
Single DL Non-Detect Percentage	70.37%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.848	Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.537E-06	Mean	-12.52
SD	5.093E-06	SD	0.993
95% DL/2 (t) UCL	7.209E-06	95% H-Stat (DL/2) UCL	1.229E-05
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2.822E-06	Mean in Log Scale	-12.54
SD	7.98E-06	SD in Log Scale	1
95% MLE (t) UCL	5.442E-06	Mean in Original Scale	5.476E-06
95% MLE (Tiku) UCL	7.42E-06	SD in Original Scale	5.127E-06
		95% Percentile Bootstrap UCL	7.157E-06
		95% BCA Bootstrap UCL	7.332E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.158	Data appear Gamma Distributed at 5% Significance Level
Theta Star	4.955E-06	
nu star	57.9	
A-D Test Statistic	0.27	
5% A-D Critical Value	0.766	
K-S Test Statistic	0.766	
5% K-S Critical Value	0.178	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	2.8E-07	Mean	5.5E-06
Maximum	0.00002	SD	5.032E-06
Mean	5.581E-06	SE of Mean	9.916E-07
Median	0.0000038	95% KM (t) UCL	7.191E-06
SD	5.072E-06	95% KM (z) UCL	7.131E-06
k star	1.232	95% KM (jackknife) UCL	7.189E-06
Theta star	4.53E-06	95% KM (bootstrap t) UCL	7.642E-06
Nu star	66.53	95% KM (BCA) UCL	7.116E-06
AppChi2	48.76	95% KM (Percentile Bootstrap) UCL	7.201E-06
95% Gamma Approximate UCL	7.614E-06	95% KM (Chebyshev) UCL	9.822E-06
95% Adjusted Gamma UCL	7.769E-06	97.5% KM (Chebyshev) UCL	1.169E-05
		99% KM (Chebyshev) UCL	1.537E-05
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	9.822E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123678-HXCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,6,7,8-HXCDD

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	27

Raw Statistics

Minimum	0.0000014
Maximum	0.000069
Mean	1.497E-05
Median	0.0000078
SD	1.872E-05
Coefficient of Variation	N/A
Skewness	2.138

Log-transformed Statistics

Minimum of Log Data	-13.48
Maximum of Log Data	-9.581
Mean of log Data	-11.68
SD of log Data	1.073

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.664
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2.112E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2.248E-05
95% Modified-t UCL	2.136E-05

Assuming Lognormal Distribution

95% H-UCL	2.609E-05
95% Chebyshev (MVUE) UCL	2.976E-05
97.5% Chebyshev (MVUE) UCL	3.633E-05
99% Chebyshev (MVUE) UCL	4.924E-05

Gamma Distribution Test

k star (bias corrected)	0.923
Theta Star	1.622E-05
MLE of Mean	1.497E-05
MLE of Standard Deviation	1.558E-05
nu star	49.84
Approximate Chi Square Value (.05)	34.63
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	33.82
Anderson-Darling Test Statistic	0.929
Anderson-Darling 5% Critical Value	0.773
Kolmogorov-Smirnov Test Statistic	0.144
Kolmogorov-Smirnov 5% Critical Value	0.173

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	2.155E-05
95% Adjusted Gamma UCL	2.206E-05

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2.09E-05
95% Jackknife UCL	2.112E-05
95% Standard Bootstrap UCL	2.073E-05
95% Bootstrap-t UCL	2.434E-05
95% Hall's Bootstrap UCL	2.107E-05
95% Percentile Bootstrap UCL	2.122E-05
95% BCA Bootstrap UCL	2.236E-05
95% Chebyshev(Mean, Sd) UCL	3.068E-05
97.5% Chebyshev(Mean, Sd) UCL	3.747E-05
99% Chebyshev(Mean, Sd) UCL	5.082E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 2.155E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123678-HXCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,6,7,8-HXCDF

General Statistics

Number of Valid Data	27	Number of Detected Data	26
Number of Distinct Detected Data	26	Number of Non-Detect Data	1
		Percent Non-Detects	3.70%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.4E-07	Minimum Detected	-14.64
Maximum Detected	0.000013	Maximum Detected	-11.25
Mean of Detected	4.596E-06	Mean of Detected	-12.72
SD of Detected	3.874E-06	SD of Detected	1.039
Minimum Non-Detect	0.0000075	Minimum Non-Detect	-11.8
Maximum Non-Detect	0.0000075	Maximum Non-Detect	-11.8

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.881	Shapiro Wilk Test Statistic	0.941
5% Shapiro Wilk Critical Value	0.92	5% Shapiro Wilk Critical Value	0.92
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.565E-06	Mean	-12.72
SD	3.802E-06	SD	1.02
95% DL/2 (t) UCL	5.813E-06	95% H-Stat (DL/2) UCL	9.59E-06
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.072E-05	Mean in Log Scale	-12.74
SD	1.58E-06	SD in Log Scale	1.021
95% MLE (t) UCL	1.124E-05	Mean in Original Scale	4.505E-06
95% MLE (Tiku) UCL	1.181E-05	SD in Original Scale	3.828E-06
		95% Percentile Bootstrap UCL	5.727E-06
		95% BCA Bootstrap UCL	5.843E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.169	Data appear Gamma Distributed at 5% Significance Level
Theta Star	3.93E-06	
nu star	60.81	
A-D Test Statistic	0.375	
5% A-D Critical Value	0.766	
K-S Test Statistic	0.766	
5% K-S Critical Value	0.175	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	4.4E-07	Mean	4.53E-06
Maximum	0.000013	SD	3.764E-06
Mean	4.557E-06	SE of Mean	7.428E-07
Median	3.545E-06	95% KM (t) UCL	5.797E-06
SD	3.804E-06	95% KM (z) UCL	5.752E-06
k star	1.211	95% KM (jackknife) UCL	5.797E-06
Theta star	3.762E-06	95% KM (bootstrap t) UCL	6.014E-06
Nu star	65.41	95% KM (BCA) UCL	5.797E-06
AppChi2	47.8	95% KM (Percentile Bootstrap) UCL	5.757E-06
95% Gamma Approximate UCL	6.236E-06	95% KM (Chebyshev) UCL	7.768E-06
95% Adjusted Gamma UCL	6.364E-06	97.5% KM (Chebyshev) UCL	9.169E-06
		99% KM (Chebyshev) UCL	1.192E-05
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	7.768E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_12378-PECDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,7,8-PECDD

General Statistics

Number of Valid Data	27	Number of Detected Data	18
Number of Distinct Detected Data	16	Number of Non-Detect Data	9
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.8E-07	Minimum Detected	-15.09
Maximum Detected	0.000011	Maximum Detected	-11.42
Mean of Detected	3.316E-06	Mean of Detected	-13.07
SD of Detected	3.313E-06	SD of Detected	1.019
Minimum Non-Detect	0.0000028	Minimum Non-Detect	-12.79
Maximum Non-Detect	0.000056	Maximum Non-Detect	-9.79

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	27
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.761	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.198E-06	Mean	-12.88
SD	5.501E-06	SD	0.994
95% DL/2 (t) UCL	6.004E-06	95% H-Stat (DL/2) UCL	1.583E-05
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-13.17
		SD in Log Scale	0.839
		Mean in Original Scale	2.735E-06
		SD in Original Scale	2.809E-06
		95% Percentile Bootstrap UCL	3.666E-06
		95% BCA Bootstrap UCL	3.897E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.071	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	3.097E-06	
nu star	38.54	
A-D Test Statistic	0.766	
5% A-D Critical Value	0.762	
K-S Test Statistic	0.762	
5% K-S Critical Value	0.208	
Data follow Appr. Gamma Distribution at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	2.8E-07	Mean	2.865E-06
Maximum	0.000011	SD	2.875E-06
Mean	3.355E-06	SE of Mean	6.052E-07
Median	3E-06	95% KM (t) UCL	3.897E-06
SD	2.683E-06	95% KM (z) UCL	3.86E-06
k star	1.619	95% KM (jackknife) UCL	3.893E-06
Theta star	2.072E-06	95% KM (bootstrap t) UCL	4.32E-06
Nu star	87.45	95% KM (BCA) UCL	3.888E-06
AppChi2	66.89	95% KM (Percentile Bootstrap) UCL	3.875E-06
95% Gamma Approximate UCL	4.386E-06	95% KM (Chebyshev) UCL	5.503E-06
95% Adjusted Gamma UCL	4.463E-06	97.5% KM (Chebyshev) UCL	6.644E-06
		99% KM (Chebyshev) UCL	8.886E-06
		Potential UCLs to Use	
		95% KM (Percentile Bootstrap) UCL	3.875E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_12378-PECDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,7,8-PECDF

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	24

Raw Statistics

Minimum	3.9E-07
Maximum	0.000013
Mean	5.35E-06
Median	0.0000039
SD	4.077E-06
Coefficient of Variation	N/A
Skewness	0.603

Log-transformed Statistics

Minimum of Log Data	-14.76
Maximum of Log Data	-11.25
Mean of log Data	-12.5
SD of log Data	0.96

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.688E-06

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6.738E-06
95% Modified-t UCL	6.703E-06

Assuming Lognormal Distribution

95% H-UCL	9.382E-06
95% Chebyshev (MVUE) UCL	1.101E-05
97.5% Chebyshev (MVUE) UCL	1.328E-05
99% Chebyshev (MVUE) UCL	1.774E-05

Gamma Distribution Test

k star (bias corrected)	1.372
Theta Star	3.898E-06
MLE of Mean	5.35E-06
MLE of Standard Deviation	4.567E-06
nu star	74.11
Approximate Chi Square Value (.05)	55.28
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	54.24
Anderson-Darling Test Statistic	0.422
Anderson-Darling 5% Critical Value	0.763
Kolmogorov-Smirnov Test Statistic	0.118
Kolmogorov-Smirnov 5% Critical Value	0.171

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	7.171E-06
95% Adjusted Gamma UCL	7.309E-06

Nonparametric Statistics

95% CLT UCL	6.64E-06
95% Jackknife UCL	6.688E-06
95% Standard Bootstrap UCL	6.599E-06
95% Bootstrap-t UCL	6.798E-06
95% Hall's Bootstrap UCL	6.679E-06
95% Percentile Bootstrap UCL	6.643E-06
95% BCA Bootstrap UCL	6.707E-06
95% Chebyshev(Mean, Sd) UCL	8.77E-06
97.5% Chebyshev(Mean, Sd) UCL	1.025E-05
99% Chebyshev(Mean, Sd) UCL	1.316E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 7.171E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123789-HXCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,7,8,9-HXCDD

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	25

Raw Statistics

Minimum	9.7E-07
Maximum	0.000036
Mean	8.886E-06
Median	0.0000066
SD	8.843E-06
Coefficient of Variation	N/A
Skewness	1.863

Log-transformed Statistics

Minimum of Log Data	-13.85
Maximum of Log Data	-10.23
Mean of log Data	-12.05
SD of log Data	0.944

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.763
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.179E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.234E-05
95% Modified-t UCL	1.189E-05

Assuming Lognormal Distribution

95% H-UCL	1.442E-05
95% Chebyshev (MVUE) UCL	1.696E-05
97.5% Chebyshev (MVUE) UCL	2.043E-05
99% Chebyshev (MVUE) UCL	2.724E-05

Gamma Distribution Test

k star (bias corrected)	1.222
Theta Star	7.274E-06
MLE of Mean	8.886E-06
MLE of Standard Deviation	8.04E-06
nu star	65.97
Approximate Chi Square Value (.05)	48.28
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	47.31
Anderson-Darling Test Statistic	0.671
Anderson-Darling 5% Critical Value	0.766
Kolmogorov-Smirnov Test Statistic	0.175
Kolmogorov-Smirnov 5% Critical Value	0.172

Data follow Appr. Gamma Distribution at 5% Significance Level

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.214E-05
95% Adjusted Gamma UCL	1.239E-05

Nonparametric Statistics

95% CLT UCL	1.169E-05
95% Jackknife UCL	1.179E-05
95% Standard Bootstrap UCL	1.165E-05
95% Bootstrap-t UCL	1.31E-05
95% Hall's Bootstrap UCL	1.279E-05
95% Percentile Bootstrap UCL	1.19E-05
95% BCA Bootstrap UCL	1.239E-05
95% Chebyshev(Mean, Sd) UCL	1.63E-05
97.5% Chebyshev(Mean, Sd) UCL	1.951E-05
99% Chebyshev(Mean, Sd) UCL	2.582E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.214E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_123789-HXCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,7,8,9-HXCDF

General Statistics

Number of Valid Data	27	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	21
		Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.3E-07	Minimum Detected	-14.45
Maximum Detected	0.0000014	Maximum Detected	-13.48
Mean of Detected	8.917E-07	Mean of Detected	-13.98
SD of Detected	3.095E-07	SD of Detected	0.339
Minimum Non-Detect	0.0000011	Minimum Non-Detect	-13.72
Maximum Non-Detect	0.000065	Maximum Non-Detect	-9.641

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	27
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.931	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.606E-06	Mean	-12.94
SD	7.578E-06	SD	1.072
95% DL/2 (t) UCL	7.093E-06	95% H-Stat (DL/2) UCL	1.71E-05
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-14.03
		SD in Log Scale	0.171
		Mean in Original Scale	8.175E-07
		SD in Original Scale	1.55E-07
		95% Percentile Bootstrap UCL	8.689E-07
		95% BCA Bootstrap UCL	8.831E-07

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	5.364	Data appear Normal at 5% Significance Level
Theta Star	1.662E-07	
nu star	64.37	
A-D Test Statistic	0.267	
5% A-D Critical Value	0.698	
K-S Test Statistic	0.698	
5% K-S Critical Value	0.332	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	5.3E-07	Mean	8.463E-07
Maximum	0.0000014	SD	2.567E-07
Mean	9.492E-07	SE of Mean	1.021E-07
Median	9.827E-07	95% KM (t) UCL	1.02E-06
SD	1.633E-07	95% KM (z) UCL	1.014E-06
k star	29.05	95% KM (jackknife) UCL	1.029E-06
Theta star	3.268E-08	95% KM (bootstrap t) UCL	1.148E-06
Nu star	1569	95% KM (BCA) UCL	1.027E-06
AppChi2	1478	95% KM (Percentile Bootstrap) UCL	1.025E-06
95% Gamma Approximate UCL	1.008E-06	95% KM (Chebyshev) UCL	1.291E-06
95% Adjusted Gamma UCL	1.012E-06	97.5% KM (Chebyshev) UCL	1.484E-06
		99% KM (Chebyshev) UCL	1.862E-06
		Potential UCLs to Use	
		95% KM (t) UCL	1.02E-06
		95% KM (Percentile Bootstrap) UCL	1.025E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_2-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	33

Raw Statistics		Log-transformed Statistics	
Minimum	0.027	Minimum of Log Data	-3.612
Maximum	6.5	Maximum of Log Data	1.872
Mean	1.188	Mean of log Data	-0.553
Median	0.41	SD of log Data	1.263
SD	1.503		
Coefficient of Variation	1.265		
Skewness	1.913		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.732	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.605	95% H-UCL	2.259
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.604
95% Adjusted-CLT UCL	1.677	97.5% Chebyshev (MVUE) UCL	3.197
95% Modified-t UCL	1.618	99% Chebyshev (MVUE) UCL	4.364

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.768	Data appear Lognormal at 5% Significance Level
Theta Star	1.547	
MLE of Mean	1.188	
MLE of Standard Deviation	1.356	
nu star	56.82	
Approximate Chi Square Value (.05)	40.49	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 1.594
Adjusted Chi Square Value	39.89	95% Jackknife UCL 1.605
		95% Standard Bootstrap UCL 1.584
Anderson-Darling Test Statistic	1.233	95% Bootstrap-t UCL 1.725
Anderson-Darling 5% Critical Value	0.785	95% Hall's Bootstrap UCL 1.729
Kolmogorov-Smirnov Test Statistic	0.199	95% Percentile Bootstrap UCL 1.617
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 1.685
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.265
		97.5% Chebyshev(Mean, Sd) UCL 2.731
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.646
95% Approximate Gamma UCL	1.667	
95% Adjusted Gamma UCL	1.692	

Potential UCL to Use	Use 95% H-UCL 2.259

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_234678-HXCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,4,6,7,8-HXCDF

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	23	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.1E-07	Minimum Detected	-14.99
Maximum Detected	0.000012	Maximum Detected	-11.33
Mean of Detected	3.32E-06	Mean of Detected	-13.12
SD of Detected	3.179E-06	SD of Detected	1.103
Minimum Non-Detect	0.0000049	Minimum Non-Detect	-12.23
Maximum Non-Detect	0.0000057	Maximum Non-Detect	-12.08

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	21
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	6
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	77.78%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.842	Shapiro Wilk Test Statistic	0.946
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.271E-06	Mean	-13.1
SD	3.06E-06	SD	1.062
95% DL/2 (t) UCL	4.275E-06	95% H-Stat (DL/2) UCL	7.962E-06
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-13.15
		SD in Log Scale	1.065
		Mean in Original Scale	3.173E-06
		SD in Original Scale	3.1E-06
		95% Percentile Bootstrap UCL	4.179E-06
		95% BCA Bootstrap UCL	4.33E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.013	Data appear Gamma Distributed at 5% Significance Level
Theta Star	3.279E-06	
nu star	50.63	
A-D Test Statistic	0.482	**Nonparametric Statistics**
5% A-D Critical Value	0.77	Kaplan-Meier (KM) Method
K-S Test Statistic	0.77	Mean 3.198E-06
5% K-S Critical Value	0.179	SD 3.046E-06
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 6.019E-07
		95% KM (t) UCL 4.224E-06
Assuming Gamma Distribution		95% KM (z) UCL 4.188E-06
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 4.224E-06
Minimum	3.1E-07	95% KM (bootstrap t) UCL 4.451E-06
Maximum	0.000012	95% KM (BCA) UCL 4.239E-06
Mean	3.257E-06	95% KM (Percentile Bootstrap) UCL 4.21E-06
Median	2.563E-06	95% KM (Chebyshev) UCL 5.821E-06
SD	3.063E-06	97.5% KM (Chebyshev) UCL 6.957E-06
k star	1.087	99% KM (Chebyshev) UCL 9.186E-06
Theta star	2.998E-06	
Nu star	58.67	**Potential UCLs to Use**
AppChi2	42.06	95% KM (Chebyshev) UCL 5.821E-06
95% Gamma Approximate UCL	4.543E-06	
95% Adjusted Gamma UCL	4.642E-06	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_23478-PECDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,4,7,8-PECDF

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	22

Raw Statistics

Minimum	4.3E-07
Maximum	0.000014
Mean	5.738E-06
Median	0.0000046
SD	4.519E-06
Coefficient of Variation	N/A
Skewness	0.693

Log-transformed Statistics

Minimum of Log Data	-14.66
Maximum of Log Data	-11.18
Mean of log Data	-12.46
SD of log Data	0.993

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.876
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	7.222E-06

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	7.293E-06
95% Modified-t UCL	7.241E-06

Assuming Lognormal Distribution

95% H-UCL	1.038E-05
95% Chebyshev (MVUE) UCL	1.209E-05
97.5% Chebyshev (MVUE) UCL	1.464E-05
99% Chebyshev (MVUE) UCL	1.964E-05

Gamma Distribution Test

k star (bias corrected)	1.294
Theta Star	4.435E-06
MLE of Mean	5.738E-06
MLE of Standard Deviation	5.045E-06
nu star	69.87
Approximate Chi Square Value (.05)	51.63
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	50.63
Anderson-Darling Test Statistic	0.436
Anderson-Darling 5% Critical Value	0.765
Kolmogorov-Smirnov Test Statistic	0.132
Kolmogorov-Smirnov 5% Critical Value	0.172

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	7.766E-06
95% Adjusted Gamma UCL	7.92E-06

Nonparametric Statistics

95% CLT UCL	7.169E-06
95% Jackknife UCL	7.222E-06
95% Standard Bootstrap UCL	7.17E-06
95% Bootstrap-t UCL	7.382E-06
95% Hall's Bootstrap UCL	7.226E-06
95% Percentile Bootstrap UCL	7.17E-06
95% BCA Bootstrap UCL	7.286E-06
95% Chebyshev(Mean, Sd) UCL	9.529E-06
97.5% Chebyshev(Mean, Sd) UCL	1.117E-05
99% Chebyshev(Mean, Sd) UCL	1.439E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 7.766E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_2378-TCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,7,8-TCDD

General Statistics

Number of Valid Data	27	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	19
		Percent Non-Detects	70.37%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0000009	Minimum Detected	-13.92
Maximum Detected	0.0000043	Maximum Detected	-12.36
Mean of Detected	2.196E-06	Mean of Detected	-13.22
SD of Detected	1.455E-06	SD of Detected	0.658
Minimum Non-Detect	0.000001	Minimum Non-Detect	-13.82
Maximum Non-Detect	0.000013	Maximum Non-Detect	-11.25

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	27
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.803	Shapiro Wilk Test Statistic	0.851
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.567E-06	Mean	-13.71
SD	1.64E-06	SD	0.763
95% DL/2 (t) UCL	2.105E-06	95% H-Stat (DL/2) UCL	2.819E-06
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-13.71
		SD in Log Scale	0.508
		Mean in Original Scale	1.307E-06
		SD in Original Scale	9.727E-07
		95% Percentile Bootstrap UCL	1.634E-06
		95% BCA Bootstrap UCL	1.714E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.805	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.217E-06	
nu star	28.88	
A-D Test Statistic	0.665	
5% A-D Critical Value	0.722	
K-S Test Statistic	0.722	
5% K-S Critical Value	0.297	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	7.524E-07	Mean	1.368E-06
Maximum	0.0000043	SD	9.623E-07
Mean	2.322E-06	SE of Mean	2.081E-07
Median	2.279E-06	95% KM (t) UCL	1.723E-06
SD	9.502E-07	95% KM (z) UCL	1.711E-06
k star	4.921	95% KM (jackknife) UCL	1.711E-06
Theta star	4.717E-07	95% KM (bootstrap t) UCL	1.884E-06
Nu star	265.8	95% KM (BCA) UCL	1.851E-06
AppChi2	229	95% KM (Percentile Bootstrap) UCL	1.772E-06
95% Gamma Approximate UCL	2.694E-06	95% KM (Chebyshev) UCL	2.275E-06
95% Adjusted Gamma UCL	2.72E-06	97.5% KM (Chebyshev) UCL	2.668E-06
		99% KM (Chebyshev) UCL	3.439E-06
		Potential UCLs to Use	
		95% KM (t) UCL	1.723E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_2378-TCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,7,8-TCDF

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	23

Raw Statistics

Minimum	7.5E-07
Maximum	0.000029
Mean	8.693E-06
Median	0.0000058
SD	7.459E-06
Coefficient of Variation	N/A
Skewness	1.349

Log-transformed Statistics

Minimum of Log Data	-14.1
Maximum of Log Data	-10.45
Mean of log Data	-12.01
SD of log Data	0.899

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.844
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.114E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.145E-05
95% Modified-t UCL	1.12E-05

Assuming Lognormal Distribution

95% H-UCL	1.389E-05
95% Chebyshev (MVUE) UCL	1.647E-05
97.5% Chebyshev (MVUE) UCL	1.973E-05
99% Chebyshev (MVUE) UCL	2.614E-05

Gamma Distribution Test

k star (bias corrected)	1.401
Theta Star	6.205E-06
MLE of Mean	8.693E-06
MLE of Standard Deviation	7.344E-06
nu star	75.65
Approximate Chi Square Value (.05)	56.62
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	55.56
Anderson-Darling Test Statistic	0.367
Anderson-Darling 5% Critical Value	0.762
Kolmogorov-Smirnov Test Statistic	0.0982
Kolmogorov-Smirnov 5% Critical Value	0.171

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1.105E-05
95% Jackknife UCL	1.114E-05
95% Standard Bootstrap UCL	1.102E-05
95% Bootstrap-t UCL	1.182E-05
95% Hall's Bootstrap UCL	1.156E-05
95% Percentile Bootstrap UCL	1.116E-05
95% BCA Bootstrap UCL	1.146E-05
95% Chebyshev(Mean, Sd) UCL	1.495E-05
97.5% Chebyshev(Mean, Sd) UCL	1.766E-05
99% Chebyshev(Mean, Sd) UCL	2.298E-05

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.162E-05
95% Adjusted Gamma UCL	1.184E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.162E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_ACENAPHTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ACENAPHTHENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	33

Raw Statistics		Log-transformed Statistics	
Minimum	0.042	Minimum of Log Data	-3.17
Maximum	5.9	Maximum of Log Data	1.775
Mean	1.011	Mean of log Data	-1.004
Median	0.24	SD of log Data	1.514
SD	1.441		
Coefficient of Variation	1.425		
Skewness	1.997		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.702	Shapiro Wilk Test Statistic	0.909
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.411	95% H-UCL	2.481
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.607
95% Adjusted-CLT UCL	1.483	97.5% Chebyshev (MVUE) UCL	3.266
95% Modified-t UCL	1.424	99% Chebyshev (MVUE) UCL	4.56

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.576	Data do not follow a Discernable Distribution (0.05)
Theta Star	1.753	
MLE of Mean	1.011	
MLE of Standard Deviation	1.331	
nu star	42.65	
Approximate Chi Square Value (.05)	28.68	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 1.4
Adjusted Chi Square Value	28.18	95% Jackknife UCL 1.411
		95% Standard Bootstrap UCL 1.391
Anderson-Darling Test Statistic	1.512	95% Bootstrap-t UCL 1.549
Anderson-Darling 5% Critical Value	0.802	95% Hall's Bootstrap UCL 1.49
Kolmogorov-Smirnov Test Statistic	0.199	95% Percentile Bootstrap UCL 1.41
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL 1.485
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.043
		97.5% Chebyshev(Mean, Sd) UCL 2.49
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.367
95% Approximate Gamma UCL	1.503	
95% Adjusted Gamma UCL	1.53	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 3.367

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_ACENAPHTHYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ACENAPHTHYLENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	32

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.057	Minimum of Log Data	-2.865
Maximum	41	Maximum of Log Data	3.714
Mean	2.929	Mean of log Data	-0.0525
Median	0.95	SD of log Data	1.482
SD	6.851		
Coefficient of Variation	2.339		
Skewness	5.058		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.409	Shapiro Wilk Test Statistic	0.98
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.83	95% H-UCL	5.965
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.359
95% Adjusted-CLT UCL	5.782	97.5% Chebyshev (MVUE) UCL	7.948
95% Modified-t UCL	4.986	99% Chebyshev (MVUE) UCL	11.07

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.528	Data appear Lognormal at 5% Significance Level
Theta Star	5.549	
MLE of Mean	2.929	
MLE of Standard Deviation	4.031	
nu star	39.05	
Approximate Chi Square Value (.05)	25.74	
Adjusted Level of Significance	0.0431	
Adjusted Chi Square Value	25.27	
Anderson-Darling Test Statistic	1.345	
Anderson-Darling 5% Critical Value	0.807	
Kolmogorov-Smirnov Test Statistic	0.166	
Kolmogorov-Smirnov 5% Critical Value	0.153	
Data not Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	4.781
95% Jackknife UCL	4.83
95% Standard Bootstrap UCL	4.778
95% Bootstrap-t UCL	8.364
95% Hall's Bootstrap UCL	11.14
95% Percentile Bootstrap UCL	4.987
95% BCA Bootstrap UCL	6.276
95% Chebyshev(Mean, Sd) UCL	7.838
97.5% Chebyshev(Mean, Sd) UCL	9.962
99% Chebyshev(Mean, Sd) UCL	14.14

Assuming Gamma Distribution	
95% Approximate Gamma UCL	4.444
95% Adjusted Gamma UCL	4.526

Potential UCL to Use		Use 95% H-UCL	5.965

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ALUMINUM

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	16

Raw Statistics

Minimum	8920
Maximum	25100
Mean	20475
Median	21400
SD	4273
Coefficient of Variation	0.209
Skewness	-1.345

Log-transformed Statistics

Minimum of Log Data	9.096
Maximum of Log Data	10.13
Mean of log Data	9.9
SD of log Data	0.257

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.875
Shapiro Wilk Critical Value	0.901

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.785
Shapiro Wilk Critical Value	0.901

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	22174

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	21764
95% Modified-t UCL	22124

Assuming Lognormal Distribution

95% H-UCL	22993
95% Chebyshev (MVUE) UCL	25898
97.5% Chebyshev (MVUE) UCL	28207
99% Chebyshev (MVUE) UCL	32742

Gamma Distribution Test

k star (bias corrected)	15.78
Theta Star	1298
MLE of Mean	20475
MLE of Standard Deviation	5155
nu star	599.5
Approximate Chi Square Value (.05)	543.7
Adjusted Level of Significance	0.0369
Adjusted Chi Square Value	539
Anderson-Darling Test Statistic	1.179
Anderson-Darling 5% Critical Value	0.74
Kolmogorov-Smirnov Test Statistic	0.242
Kolmogorov-Smirnov 5% Critical Value	0.198

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	22576
95% Adjusted Gamma UCL	22770

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	22087
95% Jackknife UCL	22174
95% Standard Bootstrap UCL	22059
95% Bootstrap-t UCL	21889
95% Hall's Bootstrap UCL	21787
95% Percentile Bootstrap UCL	21974
95% BCA Bootstrap UCL	21805
95% Chebyshev(Mean, Sd) UCL	24747
97.5% Chebyshev(Mean, Sd) UCL	26596
99% Chebyshev(Mean, Sd) UCL	30228

Potential UCL to Use

Use 95% Student's-t UCL 22174

or 95% Modified-t UCL 22124

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_ANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ANTHRACENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	35

Raw Statistics		Log-transformed Statistics	
Minimum	0.14	Minimum of Log Data	-1.966
Maximum	21	Maximum of Log Data	3.045
Mean	3.789	Mean of log Data	0.359
Median	1.2	SD of log Data	1.479
SD	5.442		
Coefficient of Variation	1.436		
Skewness	2.027		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.683	Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.3	95% H-UCL	8.926
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	9.531
95% Adjusted-CLT UCL	5.579	97.5% Chebyshev (MVUE) UCL	11.91
95% Modified-t UCL	5.349	99% Chebyshev (MVUE) UCL	16.58

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.597	Data appear Lognormal at 5% Significance Level
Theta Star	6.347	
MLE of Mean	3.789	
MLE of Standard Deviation	4.904	
nu star	44.18	
Approximate Chi Square Value (.05)	29.94	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 5.261
Adjusted Chi Square Value	29.43	95% Jackknife UCL 5.3
		95% Standard Bootstrap UCL 5.248
Anderson-Darling Test Statistic	1.148	95% Bootstrap-t UCL 5.831
Anderson-Darling 5% Critical Value	0.8	95% Hall's Bootstrap UCL 5.536
Kolmogorov-Smirnov Test Statistic	0.158	95% Percentile Bootstrap UCL 5.354
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL 5.548
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.689
		97.5% Chebyshev(Mean, Sd) UCL 9.376
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 12.69
95% Approximate Gamma UCL	5.592	
95% Adjusted Gamma UCL	5.689	

Potential UCL to Use		Use 95% H-UCL	8.926

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ANTIMONY

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	31

Raw Statistics		Log-transformed Statistics	
Minimum	0.28	Minimum of Log Data	-1.273
Maximum	3.3	Maximum of Log Data	1.194
Mean	1.214	Mean of log Data	0.046
Median	1	SD of log Data	0.559
SD	0.69		
Coefficient of Variation	0.568		
Skewness	1.249		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.891	Shapiro Wilk Test Statistic	0.981
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.406	95% H-UCL	1.469
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.735
95% Adjusted-CLT UCL	1.426	97.5% Chebyshev (MVUE) UCL	1.958
95% Modified-t UCL	1.41	99% Chebyshev (MVUE) UCL	2.397

Gamma Distribution Test		Data Distribution
k star (bias corrected)	3.266	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.372	
MLE of Mean	1.214	
MLE of Standard Deviation	0.672	
nu star	241.7	
Approximate Chi Square Value (.05)	206.7	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 1.401
Adjusted Chi Square Value	205.3	95% Jackknife UCL 1.406
		95% Standard Bootstrap UCL 1.397
Anderson-Darling Test Statistic	0.428	95% Bootstrap-t UCL 1.44
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL 1.435
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL 1.404
Kolmogorov-Smirnov 5% Critical Value	0.146	95% BCA Bootstrap UCL 1.428
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.709
		97.5% Chebyshev(Mean, Sd) UCL 1.923
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.343
95% Approximate Gamma UCL	1.42	
95% Adjusted Gamma UCL	1.429	

Potential UCL to Use	Use 95% Approximate Gamma UCL 1.42

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ARSENIC

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	35

Raw Statistics

Minimum	4.5
Maximum	72
Mean	23.37
Median	18.9
SD	14.71
Coefficient of Variation	0.629
Skewness	1.486

Log-transformed Statistics

Minimum of Log Data	1.504
Maximum of Log Data	4.277
Mean of log Data	2.98
SD of log Data	0.593

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.863
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.986
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	27.45

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	27.98
95% Modified-t UCL	27.55

Assuming Lognormal Distribution

95% H-UCL	28.59
95% Chebyshev (MVUE) UCL	33.93
97.5% Chebyshev (MVUE) UCL	38.51
99% Chebyshev (MVUE) UCL	47.5

Gamma Distribution Test

k star (bias corrected)	2.849
Theta Star	8.202
MLE of Mean	23.37
MLE of Standard Deviation	13.85
nu star	210.8
Approximate Chi Square Value (.05)	178.2
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	176.9
Anderson-Darling Test Statistic	0.531
Anderson-Darling 5% Critical Value	0.754
Kolmogorov-Smirnov Test Statistic	0.0968
Kolmogorov-Smirnov 5% Critical Value	0.146

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	27.35
95% Jackknife UCL	27.45
95% Standard Bootstrap UCL	27.3
95% Bootstrap-t UCL	28.34
95% Hall's Bootstrap UCL	28.3
95% Percentile Bootstrap UCL	27.53
95% BCA Bootstrap UCL	27.91
95% Chebyshev(Mean, Sd) UCL	33.91
97.5% Chebyshev(Mean, Sd) UCL	38.47
99% Chebyshev(Mean, Sd) UCL	47.42

Assuming Gamma Distribution

95% Approximate Gamma UCL	27.64
95% Adjusted Gamma UCL	27.85

Potential UCL to Use

Use 95% Approximate Gamma UCL 27.64

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_BENZOAANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)ANTHRACENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	33

Raw Statistics

Minimum	0.28
Maximum	61
Mean	9.282
Median	4
SD	13.8
Coefficient of Variation	1.486
Skewness	2.41

Log-transformed Statistics

Minimum of Log Data	-1.273
Maximum of Log Data	4.111
Mean of log Data	1.268
SD of log Data	1.478

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.67
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	13.11

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	13.97
95% Modified-t UCL	13.26

Assuming Lognormal Distribution

95% H-UCL	22.11
95% Chebyshev (MVUE) UCL	23.62
97.5% Chebyshev (MVUE) UCL	29.52
99% Chebyshev (MVUE) UCL	41.09

Gamma Distribution Test

k star (bias corrected)	0.604
Theta Star	15.36
MLE of Mean	9.282
MLE of Standard Deviation	11.94
nu star	44.73
Approximate Chi Square Value (.05)	30.39
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	29.87
Anderson-Darling Test Statistic	0.828
Anderson-Darling 5% Critical Value	0.799
Kolmogorov-Smirnov Test Statistic	0.137
Kolmogorov-Smirnov 5% Critical Value	0.152

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	13.66
95% Adjusted Gamma UCL	13.9

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	13.01
95% Jackknife UCL	13.11
95% Standard Bootstrap UCL	12.98
95% Bootstrap-t UCL	15
95% Hall's Bootstrap UCL	15.14
95% Percentile Bootstrap UCL	13.1
95% BCA Bootstrap UCL	14.03
95% Chebyshev(Mean, Sd) UCL	19.17
97.5% Chebyshev(Mean, Sd) UCL	23.45
99% Chebyshev(Mean, Sd) UCL	31.85

Potential UCL to Use

Use 95% Approximate Gamma UCL 13.66

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_BENZOAPYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)PYRENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	30

Raw Statistics		Log-transformed Statistics	
Minimum	0.32	Minimum of Log Data	-1.139
Maximum	56	Maximum of Log Data	4.025
Mean	8.928	Mean of log Data	1.458
Median	5.3	SD of log Data	1.342
SD	11.22		
Coefficient of Variation	1.256		
Skewness	2.477		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.724	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.04	95% H-UCL	19.82
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	22.32
95% Adjusted-CLT UCL	12.76	97.5% Chebyshev (MVUE) UCL	27.59
95% Modified-t UCL	12.17	99% Chebyshev (MVUE) UCL	37.95

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.763	Data appear Gamma Distributed at 5% Significance Level
Theta Star	11.7	
MLE of Mean	8.928	
MLE of Standard Deviation	10.22	
nu star	56.45	
Approximate Chi Square Value (.05)	40.18	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 11.96
Adjusted Chi Square Value	39.59	95% Jackknife UCL 12.04
		95% Standard Bootstrap UCL 11.97
Anderson-Darling Test Statistic	0.351	95% Bootstrap-t UCL 13.47
Anderson-Darling 5% Critical Value	0.786	95% Hall's Bootstrap UCL 14.35
Kolmogorov-Smirnov Test Statistic	0.0775	95% Percentile Bootstrap UCL 12.03
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 12.78
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 16.96
		97.5% Chebyshev(Mean, Sd) UCL 20.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 27.27
95% Approximate Gamma UCL	12.54	
95% Adjusted Gamma UCL	12.73	

Potential UCL to Use	Use 95% Approximate Gamma UCL 12.54

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_BENZOBFLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	32

Raw Statistics		Log-transformed Statistics	
Minimum	0.58	Minimum of Log Data	-0.545
Maximum	53	Maximum of Log Data	3.97
Mean	9.297	Mean of log Data	1.634
Median	4.9	SD of log Data	1.125
SD	11.45		
Coefficient of Variation	1.232		
Skewness	2.367		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.712	Shapiro Wilk Test Statistic	0.982
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.48	95% H-UCL	15.53
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18.45
95% Adjusted-CLT UCL	13.18	97.5% Chebyshev (MVUE) UCL	22.37
95% Modified-t UCL	12.6	99% Chebyshev (MVUE) UCL	30.07

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.911	Data appear Gamma Distributed at 5% Significance Level
Theta Star	10.2	
MLE of Mean	9.297	
MLE of Standard Deviation	9.738	
nu star	67.45	
Approximate Chi Square Value (.05)	49.55	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 12.39
Adjusted Chi Square Value	48.88	95% Jackknife UCL 12.48
		95% Standard Bootstrap UCL 12.34
Anderson-Darling Test Statistic	0.614	95% Bootstrap-t UCL 14.01
Anderson-Darling 5% Critical Value	0.778	95% Hall's Bootstrap UCL 14.18
Kolmogorov-Smirnov Test Statistic	0.111	95% Percentile Bootstrap UCL 12.58
Kolmogorov-Smirnov 5% Critical Value	0.149	95% BCA Bootstrap UCL 13.31
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 17.5
		97.5% Chebyshev(Mean, Sd) UCL 21.06
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.03
95% Approximate Gamma UCL	12.66	
95% Adjusted Gamma UCL	12.83	

Potential UCL to Use	Use 95% Approximate Gamma UCL 12.66

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_BENZOGHIPERYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(GHI)PERYLENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	32

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.22	Minimum of Log Data	-1.514
Maximum	20	Maximum of Log Data	2.996
Mean	5.183	Mean of log Data	1.021
Median	3.3	SD of log Data	1.261
SD	5.442		
Coefficient of Variation	1.05		
Skewness	1.431		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.804	Shapiro Wilk Test Statistic	0.953
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	6.693	95% H-UCL	10.85
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12.52
95% Adjusted-CLT UCL	6.88	97.5% Chebyshev (MVUE) UCL	15.37
95% Modified-t UCL	6.729	99% Chebyshev (MVUE) UCL	20.97

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.874	Data appear Gamma Distributed at 5% Significance Level
Theta Star	5.927	
MLE of Mean	5.183	
MLE of Standard Deviation	5.543	
nu star	64.71	
Approximate Chi Square Value (.05)	47.2	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 6.655
Adjusted Chi Square Value	46.55	95% Jackknife UCL 6.693
		95% Standard Bootstrap UCL 6.634
Anderson-Darling Test Statistic	0.295	95% Bootstrap-t UCL 7.044
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL 6.839
Kolmogorov-Smirnov Test Statistic	0.076	95% Percentile Bootstrap UCL 6.711
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 6.938
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 9.083
		97.5% Chebyshev(Mean, Sd) UCL 10.77
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 14.08
95% Approximate Gamma UCL	7.106	
95% Adjusted Gamma UCL	7.205	

Potential UCL to Use		Use 95% Approximate Gamma UCL	7.106

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_BENZOKFLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(K)FLUORANTHENE

General Statistics

Number of Valid Data	37	Number of Detected Data	19
Number of Distinct Detected Data	16	Number of Non-Detect Data	18
		Percent Non-Detects	48.65%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.19	Minimum Detected	-1.661
Maximum Detected	18	Maximum Detected	2.89
Mean of Detected	5.477	Mean of Detected	0.956
SD of Detected	6.07	SD of Detected	1.412
Minimum Non-Detect	0.032	Minimum Non-Detect	-3.442
Maximum Non-Detect	2.2	Maximum Non-Detect	0.788

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	28
Number treated as Detected	9
Single DL Non-Detect Percentage	75.68%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.784	Shapiro Wilk Test Statistic	0.932
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.877	Mean	-0.757
SD	5.078	SD	2.127
95% DL/2 (t) UCL	4.286	95% H-Stat (DL/2) UCL	19.55
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.695
		SD in Log Scale	2.03
		Mean in Original Scale	2.862
		SD in Original Scale	5.084
		95% Percentile Bootstrap UCL	4.292
		95% BCA Bootstrap UCL	4.577

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.706	Data appear Gamma Distributed at 5% Significance Level
Theta Star	7.753	
nu star	26.85	
A-D Test Statistic	0.505	
5% A-D Critical Value	0.777	
K-S Test Statistic	0.777	
5% K-S Critical Value	0.206	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.19	Mean	2.916
Maximum	18	SD	4.987
Mean	4.92	SE of Mean	0.843
Median	3.863	95% KM (t) UCL	4.338
SD	4.551	95% KM (z) UCL	4.302
k star	1.142	95% KM (jackknife) UCL	4.282
Theta star	4.31	95% KM (bootstrap t) UCL	4.831
Nu star	84.47	95% KM (BCA) UCL	4.546
AppChi2	64.29	95% KM (Percentile Bootstrap) UCL	4.375
95% Gamma Approximate UCL	6.464	95% KM (Chebyshev) UCL	6.588
95% Adjusted Gamma UCL	6.542	97.5% KM (Chebyshev) UCL	8.177
		99% KM (Chebyshev) UCL	11.3
		Potential UCLs to Use	
		95% KM (BCA) UCL	4.546

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_BERYLLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BERYLLIUM

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	16

Raw Statistics

Minimum	0.5
Maximum	2.2
Mean	1.531
Median	1.6
SD	0.464
Coefficient of Variation	0.303
Skewness	-0.37

Log-transformed Statistics

Minimum of Log Data	-0.693
Maximum of Log Data	0.788
Mean of log Data	0.371
SD of log Data	0.357

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.936

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.66

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.651
95% Modified-t UCL	1.659

Assuming Lognormal Distribution

95% H-UCL	1.721
95% Chebyshev (MVUE) UCL	1.946
97.5% Chebyshev (MVUE) UCL	2.12
99% Chebyshev (MVUE) UCL	2.464

Gamma Distribution Test

k star (bias corrected)	8.55
Theta Star	0.179
MLE of Mean	1.531
MLE of Standard Deviation	0.524
nu star	632.7
Approximate Chi Square Value (.05)	575.3
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	573
Anderson-Darling Test Statistic	0.837
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.164
Kolmogorov-Smirnov 5% Critical Value	0.145

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.683
95% Adjusted Gamma UCL	1.69

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1.656
95% Jackknife UCL	1.66
95% Standard Bootstrap UCL	1.654
95% Bootstrap-t UCL	1.652
95% Hall's Bootstrap UCL	1.648
95% Percentile Bootstrap UCL	1.654
95% BCA Bootstrap UCL	1.652
95% Chebyshev(Mean, Sd) UCL	1.863
97.5% Chebyshev(Mean, Sd) UCL	2.007
99% Chebyshev(Mean, Sd) UCL	2.289

Potential UCL to Use

Use 95% Student's-t UCL 1.66

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CADMIUM

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	25

Raw Statistics

Minimum	0.36
Maximum	7.7
Mean	2.371
Median	1.8
SD	1.732
Coefficient of Variation	0.73
Skewness	1.761

Log-transformed Statistics

Minimum of Log Data	-1.022
Maximum of Log Data	2.041
Mean of log Data	0.65
SD of log Data	0.655

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.791
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2.851

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2.927
95% Modified-t UCL	2.865

Assuming Lognormal Distribution

95% H-UCL	2.967
95% Chebyshev (MVUE) UCL	3.552
97.5% Chebyshev (MVUE) UCL	4.068
99% Chebyshev (MVUE) UCL	5.082

Gamma Distribution Test

k star (bias corrected)	2.318
Theta Star	1.022
MLE of Mean	2.371
MLE of Standard Deviation	1.557
nu star	171.6
Approximate Chi Square Value (.05)	142.3
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	141.1
Anderson-Darling Test Statistic	1.167
Anderson-Darling 5% Critical Value	0.757
Kolmogorov-Smirnov Test Statistic	0.224
Kolmogorov-Smirnov 5% Critical Value	0.146

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	2.859
95% Adjusted Gamma UCL	2.882

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2.839
95% Jackknife UCL	2.851
95% Standard Bootstrap UCL	2.827
95% Bootstrap-t UCL	2.997
95% Hall's Bootstrap UCL	2.936
95% Percentile Bootstrap UCL	2.862
95% BCA Bootstrap UCL	2.929
95% Chebyshev(Mean, Sd) UCL	3.611
97.5% Chebyshev(Mean, Sd) UCL	4.148
99% Chebyshev(Mean, Sd) UCL	5.203

Potential UCL to Use	Use 95% H-UCL 2.967

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHROMIUM

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	37

Raw Statistics

Minimum	42
Maximum	504
Mean	204.6
Median	178
SD	106.4
Coefficient of Variation	0.52
Skewness	1.121

Log-transformed Statistics

Minimum of Log Data	3.738
Maximum of Log Data	6.223
Mean of log Data	5.196
SD of log Data	0.513

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.899
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	234.1

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	236.8
95% Modified-t UCL	234.6

Assuming Lognormal Distribution

95% H-UCL	242.7
95% Chebyshev (MVUE) UCL	284.2
97.5% Chebyshev (MVUE) UCL	318.5
99% Chebyshev (MVUE) UCL	385.7

Gamma Distribution Test

k star (bias corrected)	3.842
Theta Star	53.24
MLE of Mean	204.6
MLE of Standard Deviation	104.4
nu star	284.3
Approximate Chi Square Value (.05)	246.2
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	244.7
Anderson-Darling Test Statistic	0.543
Anderson-Darling 5% Critical Value	0.752
Kolmogorov-Smirnov Test Statistic	0.118
Kolmogorov-Smirnov 5% Critical Value	0.146

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	233.3
95% Jackknife UCL	234.1
95% Standard Bootstrap UCL	233.2
95% Bootstrap-t UCL	238.5
95% Hall's Bootstrap UCL	237.3
95% Percentile Bootstrap UCL	233.5
95% BCA Bootstrap UCL	236.5
95% Chebyshev(Mean, Sd) UCL	280.8
97.5% Chebyshev(Mean, Sd) UCL	313.8
99% Chebyshev(Mean, Sd) UCL	378.5

Assuming Gamma Distribution

95% Approximate Gamma UCL	236.2
95% Adjusted Gamma UCL	237.6

Potential UCL to Use

Use 95% Approximate Gamma UCL 236.2

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_CHRYSENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHRYSENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	36

Raw Statistics		Log-transformed Statistics	
Minimum	0.28	Minimum of Log Data	-1.273
Maximum	63	Maximum of Log Data	4.143
Mean	8.702	Mean of log Data	1.26
Median	3.9	SD of log Data	1.421
SD	13.04		
Coefficient of Variation	1.499		
Skewness	2.685		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.66	Shapiro Wilk Test Statistic	0.975
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.32	95% H-UCL	19.28
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	21.09
95% Adjusted-CLT UCL	13.24	97.5% Chebyshev (MVUE) UCL	26.24
95% Modified-t UCL	12.48	99% Chebyshev (MVUE) UCL	36.36

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.636	Data appear Gamma Distributed at 5% Significance Level
Theta Star	13.68	
MLE of Mean	8.702	
MLE of Standard Deviation	10.91	
nu star	47.07	
Approximate Chi Square Value (.05)	32.33	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 12.23
Adjusted Chi Square Value	31.8	95% Jackknife UCL 12.32
		95% Standard Bootstrap UCL 12.13
Anderson-Darling Test Statistic	0.733	95% Bootstrap-t UCL 14.58
Anderson-Darling 5% Critical Value	0.796	95% Hall's Bootstrap UCL 15.2
Kolmogorov-Smirnov Test Statistic	0.104	95% Percentile Bootstrap UCL 12.39
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL 13.49
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 18.05
		97.5% Chebyshev(Mean, Sd) UCL 22.09
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 30.04
95% Approximate Gamma UCL	12.67	
95% Adjusted Gamma UCL	12.88	

Potential UCL to Use		Use 95% Approximate Gamma UCL	12.67

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_COBALT.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_COBALT

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	18

Raw Statistics

Minimum	13.5
Maximum	53
Mean	26.11
Median	26.4
SD	7.79
Coefficient of Variation	0.298
Skewness	2.116

Log-transformed Statistics

Minimum of Log Data	2.603
Maximum of Log Data	3.97
Mean of log Data	3.226
SD of log Data	0.272

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.743
Shapiro Wilk Critical Value	0.901

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical Value	0.901

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	29.21

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	29.97
95% Modified-t UCL	29.35

Assuming Lognormal Distribution

95% H-UCL	29.38
95% Chebyshev (MVUE) UCL	33.26
97.5% Chebyshev (MVUE) UCL	36.37
99% Chebyshev (MVUE) UCL	42.48

Gamma Distribution Test

k star (bias corrected)	11.79
Theta Star	2.214
MLE of Mean	26.11
MLE of Standard Deviation	7.602
nu star	448.2
Approximate Chi Square Value (.05)	400.1
Adjusted Level of Significance	0.0369
Adjusted Chi Square Value	396.1
Anderson-Darling Test Statistic	1.394
Anderson-Darling 5% Critical Value	0.741
Kolmogorov-Smirnov Test Statistic	0.259
Kolmogorov-Smirnov 5% Critical Value	0.198

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	29.25
95% Adjusted Gamma UCL	29.54

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	29.05
95% Jackknife UCL	29.21
95% Standard Bootstrap UCL	28.96
95% Bootstrap-t UCL	30.28
95% Hall's Bootstrap UCL	45.53
95% Percentile Bootstrap UCL	29.23
95% BCA Bootstrap UCL	30.18
95% Chebyshev(Mean, Sd) UCL	33.9
97.5% Chebyshev(Mean, Sd) UCL	37.27
99% Chebyshev(Mean, Sd) UCL	43.89

Potential UCL to Use

Use 95% Student's-t UCL	29.21
or 95% Modified-t UCL	29.35

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_COPPER

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	35

Raw Statistics

Minimum	27.4
Maximum	595
Mean	138
Median	87.7
SD	116.9
Coefficient of Variation	0.847
Skewness	2.305

Log-transformed Statistics

Minimum of Log Data	3.311
Maximum of Log Data	6.389
Mean of log Data	4.678
SD of log Data	0.685

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.742
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	170.5

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	177.4
95% Modified-t UCL	171.7

Assuming Lognormal Distribution

95% H-UCL	172
95% Chebyshev (MVUE) UCL	206.6
97.5% Chebyshev (MVUE) UCL	237.7
99% Chebyshev (MVUE) UCL	298.6

Gamma Distribution Test

k star (bias corrected)	1.998
Theta Star	69.08
MLE of Mean	138
MLE of Standard Deviation	97.64
nu star	147.8
Approximate Chi Square Value (.05)	120.7
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	119.7
Anderson-Darling Test Statistic	1.374
Anderson-Darling 5% Critical Value	0.759
Kolmogorov-Smirnov Test Statistic	0.206
Kolmogorov-Smirnov 5% Critical Value	0.147

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	169
95% Adjusted Gamma UCL	170.5

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	169.6
95% Jackknife UCL	170.5
95% Standard Bootstrap UCL	169
95% Bootstrap-t UCL	184.5
95% Hall's Bootstrap UCL	190.8
95% Percentile Bootstrap UCL	170.6
95% BCA Bootstrap UCL	178.5
95% Chebyshev(Mean, Sd) UCL	221.8
97.5% Chebyshev(Mean, Sd) UCL	258
99% Chebyshev(Mean, Sd) UCL	329.2

Potential UCL to Use

Use 95% H-UCL 172

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_CYANIDE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CYANIDE

General Statistics

Number of Valid Data	19	Number of Detected Data	16
Number of Distinct Detected Data	15	Number of Non-Detect Data	3
		Percent Non-Detects	15.79%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.26	Minimum Detected	-1.347
Maximum Detected	84	Maximum Detected	4.431
Mean of Detected	7.503	Mean of Detected	0.697
SD of Detected	20.51	SD of Detected	1.394
Minimum Non-Detect	1.6	Minimum Non-Detect	0.47
Maximum Non-Detect	1.8	Maximum Non-Detect	0.588

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	57.89%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.357	Shapiro Wilk Test Statistic	0.925
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.45	Mean	0.558
SD	18.89	SD	1.315
95% DL/2 (t) UCL	13.96	95% H-Stat (DL/2) UCL	14.82
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.522
		SD in Log Scale	1.345
		Mean in Original Scale	6.429
		SD in Original Scale	18.9
		95% Percentile Bootstrap UCL	14.9
		95% BCA Bootstrap UCL	19.58

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.435	Data appear Lognormal at 5% Significance Level
Theta Star	17.24	
nu star	13.92	
A-D Test Statistic	1.74	**Nonparametric Statistics**
5% A-D Critical Value	0.8	Kaplan-Meier (KM) Method
K-S Test Statistic	0.8	Mean 6.436
5% K-S Critical Value	0.228	SD 18.39
Data not Gamma Distributed at 5% Significance Level		SE of Mean 4.358
		95% KM (t) UCL 13.99
Assuming Gamma Distribution		95% KM (z) UCL 13.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 13.95
Minimum	1E-09	95% KM (bootstrap t) UCL 63.99
Maximum	84	95% KM (BCA) UCL 15.15
Mean	6.351	95% KM (Percentile Bootstrap) UCL 14.99
Median	1.2	95% KM (Chebyshev) UCL 25.43
SD	18.92	97.5% KM (Chebyshev) UCL 33.65
k star	0.212	99% KM (Chebyshev) UCL 49.79
Theta star	29.91	
Nu star	8.069	**Potential UCLs to Use**
AppChi2	2.775	97.5% KM (Chebyshev) UCL 33.65
95% Gamma Approximate UCL	18.47	
95% Adjusted Gamma UCL	20.41	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_DIBENZOAHANTHRACEN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	37	Number of Detected Data	34
Number of Distinct Detected Data	31	Number of Non-Detect Data	3
		Percent Non-Detects	8.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.086	Minimum Detected	-2.453
Maximum Detected	6.3	Maximum Detected	1.841
Mean of Detected	1.428	Mean of Detected	-0.265
SD of Detected	1.607	SD of Detected	1.193
Minimum Non-Detect	0.13	Minimum Non-Detect	-2.04
Maximum Non-Detect	0.3	Maximum Non-Detect	-1.204

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	11
Number treated as Detected	26
Single DL Non-Detect Percentage	29.73%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.771	Shapiro Wilk Test Statistic	0.964
5% Shapiro Wilk Critical Value	0.933	5% Shapiro Wilk Critical Value	0.933
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.32	Mean	-0.442
SD	1.582	SD	1.298
95% DL/2 (t) UCL	1.759	95% H-Stat (DL/2) UCL	2.831
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.96	Mean in Log Scale	-0.422
SD	1.984	SD in Log Scale	1.265
95% MLE (t) UCL	1.511	Mean in Original Scale	1.322
95% MLE (Tiku) UCL	1.537	SD in Original Scale	1.581
		95% Percentile Bootstrap UCL	1.767
		95% BCA Bootstrap UCL	1.82

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.873	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.635	
nu star	59.4	
A-D Test Statistic	0.582	**Nonparametric Statistics**
5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method
K-S Test Statistic	0.779	Mean 1.322
5% K-S Critical Value	0.156	SD 1.559
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.26
		95% KM (t) UCL 1.762
Assuming Gamma Distribution		95% KM (z) UCL 1.75
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 1.761
Minimum	1E-09	95% KM (bootstrap t) UCL 1.879
Maximum	6.3	95% KM (BCA) UCL 1.767
Mean	1.313	95% KM (Percentile Bootstrap) UCL 1.76
Median	0.62	95% KM (Chebyshev) UCL 2.457
SD	1.589	97.5% KM (Chebyshev) UCL 2.947
k star	0.305	99% KM (Chebyshev) UCL 3.911
Theta star	4.307	
Nu star	22.55	Potential UCLs to Use
AppChi2	12.75	95% KM (Chebyshev) UCL 2.457
95% Gamma Approximate UCL	2.321	
95% Adjusted Gamma UCL	2.381	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORANTHENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	34

Raw Statistics		Log-transformed Statistics	
Minimum	0.53	Minimum of Log Data	-0.635
Maximum	140	Maximum of Log Data	4.942
Mean	20.22	Mean of log Data	1.965
Median	8.4	SD of log Data	1.564
SD	30.65		
Coefficient of Variation	1.515		
Skewness	2.522		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.663	Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	28.73	95% H-UCL	54.53
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	55.88
95% Adjusted-CLT UCL	30.74	97.5% Chebyshev (MVUE) UCL	70.25
95% Modified-t UCL	29.08	99% Chebyshev (MVUE) UCL	98.48

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.564	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	35.87	
MLE of Mean	20.22	
MLE of Standard Deviation	26.93	
nu star	41.72	
Approximate Chi Square Value (.05)	27.92	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 28.51
Adjusted Chi Square Value	27.43	95% Jackknife UCL 28.73
		95% Standard Bootstrap UCL 28.38
Anderson-Darling Test Statistic	0.946	95% Bootstrap-t UCL 33.17
Anderson-Darling 5% Critical Value	0.803	95% Hall's Bootstrap UCL 32.94
Kolmogorov-Smirnov Test Statistic	0.151	95% Percentile Bootstrap UCL 28.91
Kolmogorov-Smirnov 5% Critical Value	0.152	95% BCA Bootstrap UCL 31.18
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 42.19
		97.5% Chebyshev(Mean, Sd) UCL 51.69
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 70.36
95% Approximate Gamma UCL	30.22	
95% Adjusted Gamma UCL	30.77	

Potential UCL to Use		Use 95% Approximate Gamma UCL	30.22

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_FLUORENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	31

Raw Statistics

Minimum	0.063
Maximum	4.5
Mean	1.04
Median	0.35
SD	1.141
Coefficient of Variation	1.096
Skewness	1.259

Log-transformed Statistics

Minimum of Log Data	-2.765
Maximum of Log Data	1.504
Mean of log Data	-0.669
SD of log Data	1.284

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.807
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.357

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.39
95% Modified-t UCL	1.364

Assuming Lognormal Distribution

95% H-UCL	2.096
95% Chebyshev (MVUE) UCL	2.402
97.5% Chebyshev (MVUE) UCL	2.955
99% Chebyshev (MVUE) UCL	4.042

Gamma Distribution Test

k star (bias corrected)	0.784
Theta Star	1.328
MLE of Mean	1.04
MLE of Standard Deviation	1.175
nu star	57.99
Approximate Chi Square Value (.05)	41.49
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	40.88
Anderson-Darling Test Statistic	1.49
Anderson-Darling 5% Critical Value	0.784
Kolmogorov-Smirnov Test Statistic	0.188
Kolmogorov-Smirnov 5% Critical Value	0.15

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.454
95% Adjusted Gamma UCL	1.476

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1.349
95% Jackknife UCL	1.357
95% Standard Bootstrap UCL	1.347
95% Bootstrap-t UCL	1.408
95% Hall's Bootstrap UCL	1.394
95% Percentile Bootstrap UCL	1.352
95% BCA Bootstrap UCL	1.392
95% Chebyshev(Mean, Sd) UCL	1.858
97.5% Chebyshev(Mean, Sd) UCL	2.212
99% Chebyshev(Mean, Sd) UCL	2.906

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 2.906

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_HPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHND0

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	37

Raw Statistics		Log-transformed Statistics	
Minimum	2.47	Minimum of Log Data	0.904
Maximum	288.3	Maximum of Log Data	5.664
Mean	61.55	Mean of log Data	3.386
Median	32.1	SD of log Data	1.314
SD	75.39		
Coefficient of Variation	1.225		
Skewness	1.809		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.741	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	82.47	95% H-UCL	128.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	146
95% Adjusted-CLT UCL	85.87	97.5% Chebyshev (MVUE) UCL	180.1
95% Modified-t UCL	83.08	99% Chebyshev (MVUE) UCL	247.1

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.76	Data appear Gamma Distributed at 5% Significance Level
Theta Star	80.99	
MLE of Mean	61.55	
MLE of Standard Deviation	70.6	
nu star	56.23	
Approximate Chi Square Value (.05)	40	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 81.93
Adjusted Chi Square Value	39.4	95% Jackknife UCL 82.47
		95% Standard Bootstrap UCL 81.71
Anderson-Darling Test Statistic	0.538	95% Bootstrap-t UCL 89.03
Anderson-Darling 5% Critical Value	0.786	95% Hall's Bootstrap UCL 85.41
Kolmogorov-Smirnov Test Statistic	0.12	95% Percentile Bootstrap UCL 82.26
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 86.77
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 115.6
		97.5% Chebyshev(Mean, Sd) UCL 138.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 184.9
95% Approximate Gamma UCL	86.53	
95% Adjusted Gamma UCL	87.83	

Potential UCL to Use	Use 95% Approximate Gamma UCL 86.53

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_HPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHNDDL

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	37

Raw Statistics		Log-transformed Statistics	
Minimum	2.58	Minimum of Log Data	0.948
Maximum	288.3	Maximum of Log Data	5.664
Mean	61.69	Mean of log Data	3.393
Median	32.36	SD of log Data	1.305
SD	75.51		
Coefficient of Variation	1.224		
Skewness	1.809		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.741	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	82.65	95% H-UCL	127.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	144.9
95% Adjusted-CLT UCL	86.05	97.5% Chebyshev (MVUE) UCL	178.6
95% Modified-t UCL	83.26	99% Chebyshev (MVUE) UCL	244.8

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.765	Data appear Gamma Distributed at 5% Significance Level
Theta Star	80.67	
MLE of Mean	61.69	
MLE of Standard Deviation	70.55	
nu star	56.59	
Approximate Chi Square Value (.05)	40.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 82.11
Adjusted Chi Square Value	39.7	95% Jackknife UCL 82.65
		95% Standard Bootstrap UCL 81.75
Anderson-Darling Test Statistic	0.557	95% Bootstrap-t UCL 88.87
Anderson-Darling 5% Critical Value	0.785	95% Hall's Bootstrap UCL 85.4
Kolmogorov-Smirnov Test Statistic	0.122	95% Percentile Bootstrap UCL 82
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 86.32
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 115.8
		97.5% Chebyshev(Mean, Sd) UCL 139.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 185.2
95% Approximate Gamma UCL	86.63	
95% Adjusted Gamma UCL	87.93	

Potential UCL to Use		Use 95% Approximate Gamma UCL	86.63

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_INDENO123-CDPYREN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_INDENO(1,2,3-CD)PYRENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	34

Raw Statistics		Log-transformed Statistics	
Minimum	0.18	Minimum of Log Data	-1.715
Maximum	25	Maximum of Log Data	3.219
Mean	5.014	Mean of log Data	0.931
Median	3	SD of log Data	1.277
SD	5.921		
Coefficient of Variation	1.181		
Skewness	1.868		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.759	Shapiro Wilk Test Statistic	0.971
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6.658	95% H-UCL	10.23
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11.75
95% Adjusted-CLT UCL	6.935	97.5% Chebyshev (MVUE) UCL	14.44
95% Modified-t UCL	6.708	99% Chebyshev (MVUE) UCL	19.74

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.81	Data appear Gamma Distributed at 5% Significance Level
Theta Star	6.188	
MLE of Mean	5.014	
MLE of Standard Deviation	5.57	
nu star	59.97	
Approximate Chi Square Value (.05)	43.16	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 6.616
Adjusted Chi Square Value	42.54	95% Jackknife UCL 6.658
		95% Standard Bootstrap UCL 6.588
Anderson-Darling Test Statistic	0.419	95% Bootstrap-t UCL 7.148
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL 6.996
Kolmogorov-Smirnov Test Statistic	0.0784	95% Percentile Bootstrap UCL 6.66
Kolmogorov-Smirnov 5% Critical Value	0.15	95% BCA Bootstrap UCL 6.992
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 9.258
		97.5% Chebyshev(Mean, Sd) UCL 11.09
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 14.7
95% Approximate Gamma UCL	6.967	
95% Adjusted Gamma UCL	7.068	

Potential UCL to Use	Use 95% Approximate Gamma UCL 6.967

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_IRON

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	19

Raw Statistics

Minimum	28700
Maximum	120000
Mean	66871
Median	61300
SD	23907
Coefficient of Variation	0.358
Skewness	0.73

Log-transformed Statistics

Minimum of Log Data	10.26
Maximum of Log Data	11.7
Mean of log Data	11.05
SD of log Data	0.364

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.901

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.966
Shapiro Wilk Critical Value	0.901

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	76382

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	76874
95% Modified-t UCL	76535

Assuming Lognormal Distribution

95% H-UCL	79063
95% Chebyshev (MVUE) UCL	91814
97.5% Chebyshev (MVUE) UCL	102561
99% Chebyshev (MVUE) UCL	123670

Gamma Distribution Test

k star (bias corrected)	7.091
Theta Star	9431
MLE of Mean	66871
MLE of Standard Deviation	25113
nu star	269.4
Approximate Chi Square Value (.05)	232.4
Adjusted Level of Significance	0.0369
Adjusted Chi Square Value	229.4

Anderson-Darling Test Statistic	0.319
Anderson-Darling 5% Critical Value	0.742
Kolmogorov-Smirnov Test Statistic	0.119
Kolmogorov-Smirnov 5% Critical Value	0.199

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	77520
95% Adjusted Gamma UCL	78534

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	75893
95% Jackknife UCL	76382
95% Standard Bootstrap UCL	75669
95% Bootstrap-t UCL	77859
95% Hall's Bootstrap UCL	77804
95% Percentile Bootstrap UCL	75826
95% BCA Bootstrap UCL	76897
95% Chebyshev(Mean, Sd) UCL	90778
97.5% Chebyshev(Mean, Sd) UCL	101123
99% Chebyshev(Mean, Sd) UCL	121443

Potential UCL to Use

Use 95% Student's-t UCL 76382

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LEAD

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	34

Raw Statistics

Minimum	43
Maximum	1280
Mean	275.3
Median	171
SD	268.9
Coefficient of Variation	0.977
Skewness	2.572

Log-transformed Statistics

Minimum of Log Data	3.761
Maximum of Log Data	7.155
Mean of log Data	5.313
SD of log Data	0.749

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.682
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.96
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	350

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	368
95% Modified-t UCL	353.1

Assuming Lognormal Distribution

95% H-UCL	350.5
95% Chebyshev (MVUE) UCL	423.3
97.5% Chebyshev (MVUE) UCL	491.3
99% Chebyshev (MVUE) UCL	624.8

Gamma Distribution Test

k star (bias corrected)	1.662
Theta Star	165.7
MLE of Mean	275.3
MLE of Standard Deviation	213.6
nu star	123
Approximate Chi Square Value (.05)	98.35
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	97.4
Anderson-Darling Test Statistic	1.404
Anderson-Darling 5% Critical Value	0.762
Kolmogorov-Smirnov Test Statistic	0.187
Kolmogorov-Smirnov 5% Critical Value	0.147

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	344.2
95% Adjusted Gamma UCL	347.6

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	348
95% Jackknife UCL	350
95% Standard Bootstrap UCL	347.8
95% Bootstrap-t UCL	394.3
95% Hall's Bootstrap UCL	443.7
95% Percentile Bootstrap UCL	351.8
95% BCA Bootstrap UCL	371
95% Chebyshev(Mean, Sd) UCL	468
97.5% Chebyshev(Mean, Sd) UCL	551.4
99% Chebyshev(Mean, Sd) UCL	715.2

Potential UCL to Use

Use 95% H-UCL 350.5

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\pahs\inp_CPOA-SS_N_LPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHND0

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	37

Raw Statistics

Minimum	1.98
Maximum	7280
Mean	253.9
Median	17.79
SD	1189
Coefficient of Variation	4.683
Skewness	6.049

Log-transformed Statistics

Minimum of Log Data	0.683
Maximum of Log Data	8.893
Mean of log Data	3.28
SD of log Data	1.787

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.207
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	584

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	783.3
95% Modified-t UCL	616.4

Assuming Lognormal Distribution

95% H-UCL	363.5
95% Chebyshev (MVUE) UCL	324.6
97.5% Chebyshev (MVUE) UCL	413.8
99% Chebyshev (MVUE) UCL	588.8

Gamma Distribution Test

k star (bias corrected)	0.298
Theta Star	851.9
MLE of Mean	253.9
MLE of Standard Deviation	465.1
nu star	22.06
Approximate Chi Square Value (.05)	12.38
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	12.07
Anderson-Darling Test Statistic	4.135
Anderson-Darling 5% Critical Value	0.856
Kolmogorov-Smirnov Test Statistic	0.256
Kolmogorov-Smirnov 5% Critical Value	0.157

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	452.4
95% Adjusted Gamma UCL	464.2

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	575.5
95% Jackknife UCL	584
95% Standard Bootstrap UCL	572.9
95% Bootstrap-t UCL	4355
95% Hall's Bootstrap UCL	1943
95% Percentile Bootstrap UCL	640.9
95% BCA Bootstrap UCL	858.9
95% Chebyshev(Mean, Sd) UCL	1106
97.5% Chebyshev(Mean, Sd) UCL	1475
99% Chebyshev(Mean, Sd) UCL	2199

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 2199

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\pahs\inp_CPOA-SS_N_LPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHNDDL

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	37

Raw Statistics

Minimum	1.98
Maximum	7280
Mean	253.9
Median	17.79
SD	1189
Coefficient of Variation	4.683
Skewness	6.049

Log-transformed Statistics

Minimum of Log Data	0.683
Maximum of Log Data	8.893
Mean of log Data	3.28
SD of log Data	1.787

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.207
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	584

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	783.3
95% Modified-t UCL	616.4

Assuming Lognormal Distribution

95% H-UCL	363.5
95% Chebyshev (MVUE) UCL	324.6
97.5% Chebyshev (MVUE) UCL	413.8
99% Chebyshev (MVUE) UCL	588.8

Gamma Distribution Test

k star (bias corrected)	0.298
Theta Star	851.9
MLE of Mean	253.9
MLE of Standard Deviation	465.1
nu star	22.06
Approximate Chi Square Value (.05)	12.38
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	12.07
Anderson-Darling Test Statistic	4.135
Anderson-Darling 5% Critical Value	0.856
Kolmogorov-Smirnov Test Statistic	0.256
Kolmogorov-Smirnov 5% Critical Value	0.157

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	452.4
95% Adjusted Gamma UCL	464.2

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	575.5
95% Jackknife UCL	584
95% Standard Bootstrap UCL	570.2
95% Bootstrap-t UCL	4339
95% Hall's Bootstrap UCL	1954
95% Percentile Bootstrap UCL	642.5
95% BCA Bootstrap UCL	859.1
95% Chebyshev(Mean, Sd) UCL	1106
97.5% Chebyshev(Mean, Sd) UCL	1475
99% Chebyshev(Mean, Sd) UCL	2199

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 2199

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_MANGANESE

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	15

Raw Statistics

Minimum	675
Maximum	1590
Mean	1162
Median	1160
SD	271.1
Coefficient of Variation	0.233
Skewness	-0.0258

Log-transformed Statistics

Minimum of Log Data	6.515
Maximum of Log Data	7.371
Mean of log Data	7.031
SD of log Data	0.245

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.963
Shapiro Wilk Critical Value	0.901

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.901

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1270

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1264
95% Modified-t UCL	1270

Assuming Lognormal Distribution

95% H-UCL	1293
95% Chebyshev (MVUE) UCL	1451
97.5% Chebyshev (MVUE) UCL	1575
99% Chebyshev (MVUE) UCL	1819

Gamma Distribution Test

k star (bias corrected)	15.55
Theta Star	74.74
MLE of Mean	1162
MLE of Standard Deviation	294.7
nu star	590.9
Approximate Chi Square Value (.05)	535.5
Adjusted Level of Significance	0.0369
Adjusted Chi Square Value	530.9
Anderson-Darling Test Statistic	0.292
Anderson-Darling 5% Critical Value	0.74
Kolmogorov-Smirnov Test Statistic	0.13
Kolmogorov-Smirnov 5% Critical Value	0.198

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1265
95% Jackknife UCL	1270
95% Standard Bootstrap UCL	1262
95% Bootstrap-t UCL	1271
95% Hall's Bootstrap UCL	1263
95% Percentile Bootstrap UCL	1261
95% BCA Bootstrap UCL	1261
95% Chebyshev(Mean, Sd) UCL	1433
97.5% Chebyshev(Mean, Sd) UCL	1551
99% Chebyshev(Mean, Sd) UCL	1781

Assuming Gamma Distribution

95% Approximate Gamma UCL	1282
95% Adjusted Gamma UCL	1294

Potential UCL to Use

Use 95% Student's-t UCL 1270

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_MERCURY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_MERCURY

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	27

Raw Statistics

Minimum	0.13
Maximum	1.7
Mean	0.567
Median	0.45
SD	0.358
Coefficient of Variation	0.631
Skewness	1.53

Log-transformed Statistics

Minimum of Log Data	-2.04
Maximum of Log Data	0.531
Mean of log Data	-0.733
SD of log Data	0.577

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.837
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.968
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.666

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.68
95% Modified-t UCL	0.669

Assuming Lognormal Distribution

95% H-UCL	0.686
95% Chebyshev (MVUE) UCL	0.812
97.5% Chebyshev (MVUE) UCL	0.92
99% Chebyshev (MVUE) UCL	1.13

Gamma Distribution Test

k star (bias corrected)	2.934
Theta Star	0.193
MLE of Mean	0.567
MLE of Standard Deviation	0.331
nu star	217.1
Approximate Chi Square Value (.05)	184
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	182.7
Anderson-Darling Test Statistic	0.891
Anderson-Darling 5% Critical Value	0.754
Kolmogorov-Smirnov Test Statistic	0.16
Kolmogorov-Smirnov 5% Critical Value	0.146

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.669
95% Adjusted Gamma UCL	0.674

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.664
95% Jackknife UCL	0.666
95% Standard Bootstrap UCL	0.664
95% Bootstrap-t UCL	0.695
95% Hall's Bootstrap UCL	0.686
95% Percentile Bootstrap UCL	0.666
95% BCA Bootstrap UCL	0.678
95% Chebyshev(Mean, Sd) UCL	0.823
97.5% Chebyshev(Mean, Sd) UCL	0.934
99% Chebyshev(Mean, Sd) UCL	1.152

Potential UCL to Use

Use 95% H-UCL 0.686

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NAPHTHALENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	35

Raw Statistics

Minimum	0.46
Maximum	7200
Mean	218.2
Median	6
SD	1180
Coefficient of Variation	5.408
Skewness	6.072

Log-transformed Statistics

Minimum of Log Data	-0.777
Maximum of Log Data	8.882
Mean of log Data	2.205
SD of log Data	1.969

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.186
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	545.8

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	744.4
95% Modified-t UCL	578.1

Assuming Lognormal Distribution

95% H-UCL	211
95% Chebyshev (MVUE) UCL	162.8
97.5% Chebyshev (MVUE) UCL	209.4
99% Chebyshev (MVUE) UCL	301

Gamma Distribution Test

k star (bias corrected)	0.226
Theta Star	963.7
MLE of Mean	218.2
MLE of Standard Deviation	458.6
nu star	16.76
Approximate Chi Square Value (.05)	8.5
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	8.244
Anderson-Darling Test Statistic	5.817
Anderson-Darling 5% Critical Value	0.889
Kolmogorov-Smirnov Test Statistic	0.306
Kolmogorov-Smirnov 5% Critical Value	0.16

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	430.3
95% Adjusted Gamma UCL	443.6

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	537.4
95% Jackknife UCL	545.8
95% Standard Bootstrap UCL	531.7
95% Bootstrap-t UCL	9431
95% Hall's Bootstrap UCL	4538
95% Percentile Bootstrap UCL	604.6
95% BCA Bootstrap UCL	810.5
95% Chebyshev(Mean, Sd) UCL	1064
97.5% Chebyshev(Mean, Sd) UCL	1430
99% Chebyshev(Mean, Sd) UCL	2149

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 2149

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NICKEL

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	35

Raw Statistics

Minimum	17.7
Maximum	56.4
Mean	39.96
Median	42.2
SD	9.755
Coefficient of Variation	0.244
Skewness	-0.5

Log-transformed Statistics

Minimum of Log Data	2.874
Maximum of Log Data	4.032
Mean of log Data	3.653
SD of log Data	0.28

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.962
Shapiro Wilk Critical Value	0.936

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	42.67

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	42.46
95% Modified-t UCL	42.65

Assuming Lognormal Distribution

95% H-UCL	43.61
95% Chebyshev (MVUE) UCL	48.27
97.5% Chebyshev (MVUE) UCL	51.8
99% Chebyshev (MVUE) UCL	58.74

Gamma Distribution Test

k star (bias corrected)	13.5
Theta Star	2.959
MLE of Mean	39.96
MLE of Standard Deviation	10.87
nu star	999.2
Approximate Chi Square Value (.05)	926.8
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	923.8
Anderson-Darling Test Statistic	0.803
Anderson-Darling 5% Critical Value	0.747
Kolmogorov-Smirnov Test Statistic	0.147
Kolmogorov-Smirnov 5% Critical Value	0.145

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	43.08
95% Adjusted Gamma UCL	43.22

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	42.6
95% Jackknife UCL	42.67
95% Standard Bootstrap UCL	42.57
95% Bootstrap-t UCL	42.53
95% Hall's Bootstrap UCL	42.51
95% Percentile Bootstrap UCL	42.48
95% BCA Bootstrap UCL	42.41
95% Chebyshev(Mean, Sd) UCL	46.95
97.5% Chebyshev(Mean, Sd) UCL	49.98
99% Chebyshev(Mean, Sd) UCL	55.92

Potential UCL to Use

Use 95% Student's-t UCL 42.67

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_OCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDD

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	25

Raw Statistics

Minimum	0.00057
Maximum	0.033
Mean	0.0047
Median	0.0028
SD	0.00643
Coefficient of Variation	1.366
Skewness	3.596

Log-transformed Statistics

Minimum of Log Data	-7.47
Maximum of Log Data	-3.411
Mean of log Data	-5.87
SD of log Data	0.991

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.583
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.971
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.00681

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.00765
95% Modified-t UCL	0.00696

Assuming Lognormal Distribution

95% H-UCL	0.0075
95% Chebyshev (MVUE) UCL	0.00875
97.5% Chebyshev (MVUE) UCL	0.0106
99% Chebyshev (MVUE) UCL	0.0142

Gamma Distribution Test

k star (bias corrected)	1.016
Theta Star	0.00463
MLE of Mean	0.0047
MLE of Standard Deviation	0.00467
nu star	54.88
Approximate Chi Square Value (.05)	38.86
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	38
Anderson-Darling Test Statistic	0.683
Anderson-Darling 5% Critical Value	0.771
Kolmogorov-Smirnov Test Statistic	0.145
Kolmogorov-Smirnov 5% Critical Value	0.173

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.00664
95% Adjusted Gamma UCL	0.0068

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.00674
95% Jackknife UCL	0.00681
95% Standard Bootstrap UCL	0.00668
95% Bootstrap-t UCL	0.00922
95% Hall's Bootstrap UCL	0.0149
95% Percentile Bootstrap UCL	0.00693
95% BCA Bootstrap UCL	0.00803
95% Chebyshev(Mean, Sd) UCL	0.0101
97.5% Chebyshev(Mean, Sd) UCL	0.0124
99% Chebyshev(Mean, Sd) UCL	0.017

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.00664

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_OCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDF

General Statistics

Number of Valid Data	27	Number of Detected Data	25
Number of Distinct Detected Data	21	Number of Non-Detect Data	2
		Percent Non-Detects	7.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.8E-07	Minimum Detected	-15.09
Maximum Detected	0.00088	Maximum Detected	-7.036
Mean of Detected	0.0001191	Mean of Detected	-10.13
SD of Detected	0.0001909	SD of Detected	1.812
Minimum Non-Detect	0.000014	Minimum Non-Detect	-11.18
Maximum Non-Detect	0.000016	Maximum Non-Detect	-11.04

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	19
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	29.63%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.608	Shapiro Wilk Test Statistic	0.95
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0001108	Mean	-10.26
SD	0.0001858	SD	1.797
95% DL/2 (t) UCL	0.0001718	95% H-Stat (DL/2) UCL	0.0008408
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0000642	Mean in Log Scale	-10.3
SD	0.0002308	SD in Log Scale	1.849
95% MLE (t) UCL	0.00014	Mean in Original Scale	0.0001106
95% MLE (Tiku) UCL	0.000143	SD in Original Scale	0.000186
		95% Percentile Bootstrap UCL	0.000174
		95% BCA Bootstrap UCL	0.000199

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.527	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0002262	
nu star	26.33	
A-D Test Statistic	0.338	
5% A-D Critical Value	0.801	
K-S Test Statistic	0.801	
5% K-S Critical Value	0.184	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.0001106
Maximum	0.00088	SD	0.0001825
Mean	0.0001103	SE of Mean	3.584E-05
Median	0.000042	95% KM (t) UCL	0.0001717
SD	0.0001861	95% KM (z) UCL	0.0001696
k star	0.353	95% KM (jackknife) UCL	0.0001716
Theta star	0.0003124	95% KM (bootstrap t) UCL	0.0002385
Nu star	19.07	95% KM (BCA) UCL	0.0001756
AppChi2	10.17	95% KM (Percentile Bootstrap) UCL	0.0001755
95% Gamma Approximate UCL	0.0002068	95% KM (Chebyshev) UCL	0.0002668
95% Adjusted Gamma UCL	0.0002157	97.5% KM (Chebyshev) UCL	0.0003344
		99% KM (Chebyshev) UCL	0.0004672
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	0.0002668

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PHENANTHRENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	33

Raw Statistics

Minimum	0.24
Maximum	20
Mean	4.861
Median	1.7
SD	5.983
Coefficient of Variation	1.231
Skewness	1.448

Log-transformed Statistics

Minimum of Log Data	-1.427
Maximum of Log Data	2.996
Mean of log Data	0.732
SD of log Data	1.402

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.748
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical Value	0.936

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.521

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6.729
95% Modified-t UCL	6.56

Assuming Lognormal Distribution

95% H-UCL	10.91
95% Chebyshev (MVUE) UCL	12.02
97.5% Chebyshev (MVUE) UCL	14.93
99% Chebyshev (MVUE) UCL	20.65

Gamma Distribution Test

k star (bias corrected)	0.671
Theta Star	7.244
MLE of Mean	4.861
MLE of Standard Deviation	5.934
nu star	49.65
Approximate Chi Square Value (.05)	34.47
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	33.92
Anderson-Darling Test Statistic	1.331
Anderson-Darling 5% Critical Value	0.792
Kolmogorov-Smirnov Test Statistic	0.188
Kolmogorov-Smirnov 5% Critical Value	0.151

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	7.001
95% Adjusted Gamma UCL	7.114

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	6.479
95% Jackknife UCL	6.521
95% Standard Bootstrap UCL	6.453
95% Bootstrap-t UCL	6.92
95% Hall's Bootstrap UCL	6.698
95% Percentile Bootstrap UCL	6.495
95% BCA Bootstrap UCL	6.711
95% Chebyshev(Mean, Sd) UCL	9.148
97.5% Chebyshev(Mean, Sd) UCL	11
99% Chebyshev(Mean, Sd) UCL	14.65

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 14.65

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SS_N_PYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PYRENE

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	32

Raw Statistics		Log-transformed Statistics	
Minimum	0.35	Minimum of Log Data	-1.05
Maximum	59	Maximum of Log Data	4.078
Mean	11.01	Mean of log Data	1.609
Median	5.6	SD of log Data	1.402
SD	13.75		
Coefficient of Variation	1.249		
Skewness	2.118		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.739	Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	14.83	95% H-UCL	26.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	28.88
95% Adjusted-CLT UCL	15.57	97.5% Chebyshev (MVUE) UCL	35.87
95% Modified-t UCL	14.96	99% Chebyshev (MVUE) UCL	49.62

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.713	Data appear Gamma Distributed at 5% Significance Level
Theta Star	15.44	
MLE of Mean	11.01	
MLE of Standard Deviation	13.04	
nu star	52.78	
Approximate Chi Square Value (.05)	37.09	**Nonparametric Statistics**
Adjusted Level of Significance	0.0431	95% CLT UCL 14.73
Adjusted Chi Square Value	36.52	95% Jackknife UCL 14.83
		95% Standard Bootstrap UCL 14.7
Anderson-Darling Test Statistic	0.467	95% Bootstrap-t UCL 16.33
Anderson-Darling 5% Critical Value	0.788	95% Hall's Bootstrap UCL 16.92
Kolmogorov-Smirnov Test Statistic	0.108	95% Percentile Bootstrap UCL 14.96
Kolmogorov-Smirnov 5% Critical Value	0.151	95% BCA Bootstrap UCL 15.67
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 20.87
		97.5% Chebyshev(Mean, Sd) UCL 25.13
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 33.51
95% Approximate Gamma UCL	15.67	
95% Adjusted Gamma UCL	15.92	

Potential UCL to Use	Use 95% Approximate Gamma UCL 15.67

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_SELENIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_SELENIUM

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	27

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.32	Minimum of Log Data	-1.139
Maximum	12.3	Maximum of Log Data	2.51
Mean	3.385	Mean of log Data	0.943
Median	2.4	SD of log Data	0.782
SD	2.691		
Coefficient of Variation	0.795		
Skewness	1.693		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.814	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.936	Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.132	95% H-UCL	4.614
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.583
95% Adjusted-CLT UCL	4.244	97.5% Chebyshev (MVUE) UCL	6.507
95% Modified-t UCL	4.152	99% Chebyshev (MVUE) UCL	8.322

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	1.816	Data appear Lognormal at 5% Significance Level
Theta Star	1.864	
MLE of Mean	3.385	
MLE of Standard Deviation	2.512	
nu star	134.4	
Approximate Chi Square Value (.05)	108.6	
Adjusted Level of Significance	0.0431	
Adjusted Chi Square Value	107.6	
Anderson-Darling Test Statistic	0.888	
Anderson-Darling 5% Critical Value	0.76	
Kolmogorov-Smirnov Test Statistic	0.154	
Kolmogorov-Smirnov 5% Critical Value	0.147	
Data not Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	4.113
95% Jackknife UCL	4.132
95% Standard Bootstrap UCL	4.117
95% Bootstrap-t UCL	4.339
95% Hall's Bootstrap UCL	4.298
95% Percentile Bootstrap UCL	4.129
95% BCA Bootstrap UCL	4.248
95% Chebyshev(Mean, Sd) UCL	5.313
97.5% Chebyshev(Mean, Sd) UCL	6.148
99% Chebyshev(Mean, Sd) UCL	7.786

Assuming Gamma Distribution	
95% Approximate Gamma UCL	4.188
95% Adjusted Gamma UCL	4.228

Potential UCL to Use	Use 95% H-UCL 4.614

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_SILVER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_SILVER

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	31

Raw Statistics

Minimum	0.12
Maximum	2.8
Mean	1.147
Median	0.93
SD	0.707
Coefficient of Variation	0.616
Skewness	0.898

Log-transformed Statistics

Minimum of Log Data	-2.12
Maximum of Log Data	1.03
Mean of log Data	-0.0772
SD of log Data	0.727

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.344

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.357
95% Modified-t UCL	1.347

Assuming Lognormal Distribution

95% H-UCL	1.555
95% Chebyshev (MVUE) UCL	1.875
97.5% Chebyshev (MVUE) UCL	2.17
99% Chebyshev (MVUE) UCL	2.748

Gamma Distribution Test

k star (bias corrected)	2.299
Theta Star	0.499
MLE of Mean	1.147
MLE of Standard Deviation	0.757
nu star	170.1
Approximate Chi Square Value (.05)	141
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	139.8
Anderson-Darling Test Statistic	0.351
Anderson-Darling 5% Critical Value	0.757
Kolmogorov-Smirnov Test Statistic	0.0932
Kolmogorov-Smirnov 5% Critical Value	0.146

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.385
95% Adjusted Gamma UCL	1.396

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	1.339
95% Jackknife UCL	1.344
95% Standard Bootstrap UCL	1.335
95% Bootstrap-t UCL	1.366
95% Hall's Bootstrap UCL	1.365
95% Percentile Bootstrap UCL	1.34
95% BCA Bootstrap UCL	1.352
95% Chebyshev(Mean, Sd) UCL	1.654
97.5% Chebyshev(Mean, Sd) UCL	1.873
99% Chebyshev(Mean, Sd) UCL	2.304

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.385

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_THALLIUM

General Statistics

Number of Valid Data	37	Number of Detected Data	33
Number of Distinct Detected Data	25	Number of Non-Detect Data	4
		Percent Non-Detects	10.81%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.22	Minimum Detected	-1.514
Maximum Detected	0.98	Maximum Detected	-0.0202
Mean of Detected	0.488	Mean of Detected	-0.823
SD of Detected	0.23	SD of Detected	0.465
Minimum Non-Detect	0.94	Minimum Non-Detect	-0.0619
Maximum Non-Detect	1.6	Maximum Non-Detect	0.47

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	37
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.896	Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.931	5% Shapiro Wilk Critical Value	0.931
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.506	Mean	-0.782
SD	0.227	SD	0.459
95% DL/2 (t) UCL	0.569	95% H-Stat (DL/2) UCL	0.738
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.825
		SD in Log Scale	0.438
		Mean in Original Scale	0.481
		SD in Original Scale	0.218
		95% Percentile Bootstrap UCL	0.541
		95% BCA Bootstrap UCL	0.543

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	4.494	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.109	
nu star	296.6	
A-D Test Statistic	0.586	
5% A-D Critical Value	0.749	
K-S Test Statistic	0.749	
5% K-S Critical Value	0.154	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.22
Maximum	0.98
Mean	0.492
Median	0.49
SD	0.218
k star	5.052
Theta star	0.0974
Nu star	373.9
AppChi2	330
95% Gamma Approximate UCL	0.557
95% Adjusted Gamma UCL	0.56

Note: DL/2 is not a recommended method.

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.486
SD	0.226
SE of Mean	0.0397
95% KM (t) UCL	0.553
95% KM (z) UCL	0.551
95% KM (jackknife) UCL	0.553
95% KM (bootstrap t) UCL	0.561
95% KM (BCA) UCL	0.55
95% KM (Percentile Bootstrap) UCL	0.551
95% KM (Chebyshev) UCL	0.659
97.5% KM (Chebyshev) UCL	0.734
99% KM (Chebyshev) UCL	0.881
Potential UCLs to Use	
95% KM (BCA) UCL	0.55

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_TIN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TIN

General Statistics

Number of Valid Observations	19	Number of Distinct Observations	18

Raw Statistics		Log-transformed Statistics	
Minimum	2.6	Minimum of Log Data	0.956
Maximum	200	Maximum of Log Data	5.298
Mean	58.39	Mean of log Data	3.673
Median	33.6	SD of log Data	0.983
SD	55.12		
Coefficient of Variation	0.944		
Skewness	1.742		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.769	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.901	Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	80.32	95% H-UCL	116.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	128.9
95% Adjusted-CLT UCL	84.59	97.5% Chebyshev (MVUE) UCL	158.1
95% Modified-t UCL	81.16	99% Chebyshev (MVUE) UCL	215.3

Gamma Distribution Test		Data Distribution
k star (bias corrected)	1.224	Data appear Gamma Distributed at 5% Significance Level
Theta Star	47.71	
MLE of Mean	58.39	
MLE of Standard Deviation	52.78	
nu star	46.51	
Approximate Chi Square Value (.05)	31.86	**Nonparametric Statistics**
Adjusted Level of Significance	0.0369	95% CLT UCL 79.19
Adjusted Chi Square Value	30.8	95% Jackknife UCL 80.32
		95% Standard Bootstrap UCL 78.78
Anderson-Darling Test Statistic	0.606	95% Bootstrap-t UCL 94.81
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL 102
Kolmogorov-Smirnov Test Statistic	0.191	95% Percentile Bootstrap UCL 79.69
Kolmogorov-Smirnov 5% Critical Value	0.202	95% BCA Bootstrap UCL 84.39
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 113.5
		97.5% Chebyshev(Mean, Sd) UCL 137.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 184.2
95% Approximate Gamma UCL	85.24	
95% Adjusted Gamma UCL	88.17	

Potential UCL to Use	Use 95% Approximate Gamma UCL 85.24

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_VANADIUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	63.5	Minimum of Log Data	4.151
Maximum	170	Maximum of Log Data	5.136
Mean	93.81	Mean of log Data	4.495
Median	78.55	SD of log Data	0.307
SD	33.51		
Coefficient of Variation	0.357		
Skewness	1.774		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.791	Shapiro Wilk Test Statistic	0.871
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	114.6	95% H-UCL	116.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	135.3
95% Adjusted-CLT UCL	119.2	97.5% Chebyshev (MVUE) UCL	153.5
95% Modified-t UCL	115.7	99% Chebyshev (MVUE) UCL	189.1

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	7.387	Data appear Gamma Distributed at 5% Significance Level
Theta Star	12.7	
MLE of Mean	93.81	
MLE of Standard Deviation	34.51	
nu star	133	
Approximate Chi Square Value (.05)	107.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 112.2
Adjusted Chi Square Value	102.5	95% Jackknife UCL 114.6
		95% Standard Bootstrap UCL 111.1
Anderson-Darling Test Statistic	0.692	95% Bootstrap-t UCL 146.1
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 197.5
Kolmogorov-Smirnov Test Statistic	0.274	95% Percentile Bootstrap UCL 112.6
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 118.1
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 142.5
		97.5% Chebyshev(Mean, Sd) UCL 163.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 205
95% Approximate Gamma UCL	116.2	
95% Adjusted Gamma UCL	121.7	

Potential UCL to Use	Use 95% Approximate Gamma UCL 116.2

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_WHO TEQ ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=0)

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	27

Raw Statistics

Minimum	1.071E-06
Maximum	2.272E-05
Mean	6.451E-06
Median	5.084E-06
SD	5.717E-06
Coefficient of Variation	N/A
Skewness	1.692

Log-transformed Statistics

Minimum of Log Data	-13.75
Maximum of Log Data	-10.69
Mean of log Data	-12.28
SD of log Data	0.835

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.79
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.923

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	8.328E-06

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	8.644E-06
95% Modified-t UCL	8.388E-06

Assuming Lognormal Distribution

95% H-UCL	9.592E-06
95% Chebyshev (MVUE) UCL	1.146E-05
97.5% Chebyshev (MVUE) UCL	1.362E-05
99% Chebyshev (MVUE) UCL	1.787E-05

Gamma Distribution Test

k star (bias corrected)	1.497
Theta Star	4.309E-06
MLE of Mean	6.451E-06
MLE of Standard Deviation	5.272E-06
nu star	80.85
Approximate Chi Square Value (.05)	61.13
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	60.03
Anderson-Darling Test Statistic	0.555
Anderson-Darling 5% Critical Value	0.761
Kolmogorov-Smirnov Test Statistic	0.139
Kolmogorov-Smirnov 5% Critical Value	0.171

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	8.532E-06
95% Adjusted Gamma UCL	8.688E-06

Nonparametric Statistics

95% CLT UCL	8.261E-06
95% Jackknife UCL	8.328E-06
95% Standard Bootstrap UCL	8.222E-06
95% Bootstrap-t UCL	8.961E-06
95% Hall's Bootstrap UCL	8.991E-06
95% Percentile Bootstrap UCL	8.31E-06
95% BCA Bootstrap UCL	8.661E-06
95% Chebyshev(Mean, Sd) UCL	1.125E-05
97.5% Chebyshev(Mean, Sd) UCL	1.332E-05
99% Chebyshev(Mean, Sd) UCL	1.74E-05

Potential UCL to Use

Use 95% Approximate Gamma UCL 8.532E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_WHO TEQ NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=DL)

General Statistics

Number of Valid Observations	27	Number of Distinct Observations	27

Raw Statistics

Minimum	3.699E-06
Maximum	7.768E-05
Mean	1.336E-05
Median	8.628E-06
SD	1.496E-05
Coefficient of Variation	N/A
Skewness	3.533

Log-transformed Statistics

Minimum of Log Data	-12.51
Maximum of Log Data	-9.463
Mean of log Data	-11.52
SD of log Data	0.698

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.558
Shapiro Wilk Critical Value	0.923

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical Value	0.923

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	1.827E-05

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2.018E-05
95% Modified-t UCL	1.859E-05

Assuming Lognormal Distribution

95% H-UCL	1.699E-05
95% Chebyshev (MVUE) UCL	2.04E-05
97.5% Chebyshev (MVUE) UCL	2.381E-05
99% Chebyshev (MVUE) UCL	3.052E-05

Gamma Distribution Test

k star (bias corrected)	1.642
Theta Star	8.133E-06
MLE of Mean	1.336E-05
MLE of Standard Deviation	1.042E-05
nu star	88.69
Approximate Chi Square Value (.05)	67.97
Adjusted Level of Significance	0.0401
Adjusted Chi Square Value	66.82
Anderson-Darling Test Statistic	1.439
Anderson-Darling 5% Critical Value	0.759
Kolmogorov-Smirnov Test Statistic	0.235
Kolmogorov-Smirnov 5% Critical Value	0.171

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	1.743E-05
95% Adjusted Gamma UCL	1.773E-05

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	1.809E-05
95% Jackknife UCL	1.827E-05
95% Standard Bootstrap UCL	1.804E-05
95% Bootstrap-t UCL	2.663E-05
95% Hall's Bootstrap UCL	4.1E-05
95% Percentile Bootstrap UCL	1.862E-05
95% BCA Bootstrap UCL	2.101E-05
95% Chebyshev(Mean, Sd) UCL	2.59E-05
97.5% Chebyshev(Mean, Sd) UCL	3.133E-05
99% Chebyshev(Mean, Sd) UCL	4.2E-05

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 2.59E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SS_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ZINC

General Statistics

Number of Valid Observations	37	Number of Distinct Observations	36

Raw Statistics

Minimum	99.5
Maximum	2730
Mean	787.5
Median	597
SD	563.1
Coefficient of Variation	0.715
Skewness	1.852

Log-transformed Statistics

Minimum of Log Data	4.6
Maximum of Log Data	7.912
Mean of log Data	6.459
SD of log Data	0.665

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.806
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.955
Shapiro Wilk Critical Value	0.936

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	943.7

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	969.8
95% Modified-t UCL	948.4

Assuming Lognormal Distribution

95% H-UCL	999.4
95% Chebyshev (MVUE) UCL	1198
97.5% Chebyshev (MVUE) UCL	1374
99% Chebyshev (MVUE) UCL	1719

Gamma Distribution Test

k star (bias corrected)	2.353
Theta Star	334.7
MLE of Mean	787.5
MLE of Standard Deviation	513.4
nu star	174.1
Approximate Chi Square Value (.05)	144.6
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value	143.4
Anderson-Darling Test Statistic	1.027
Anderson-Darling 5% Critical Value	0.757
Kolmogorov-Smirnov Test Statistic	0.175
Kolmogorov-Smirnov 5% Critical Value	0.146

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	948.2
95% Adjusted Gamma UCL	955.9

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	939.7
95% Jackknife UCL	943.7
95% Standard Bootstrap UCL	937.9
95% Bootstrap-t UCL	995.1
95% Hall's Bootstrap UCL	993.9
95% Percentile Bootstrap UCL	943.4
95% BCA Bootstrap UCL	971.7
95% Chebyshev(Mean, Sd) UCL	1191
97.5% Chebyshev(Mean, Sd) UCL	1366
99% Chebyshev(Mean, Sd) UCL	1709

Potential UCL to Use	Use 95% H-UCL 999.4

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	C:\Documents and Settings\ccheatwood\My Documents\PCB test run.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	10000								
7												
8												
9	PCBND=DL											
10												
11						General Statistics						
12						Number of Valid Data	27			Number of Detected Data		26
13						Number of Distinct Detected Data	26			Number of Non-Detect Data		1
14										Percent Non-Detects		3.70%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	0.0117			Minimum Detected		-4.452
18						Maximum Detected	0.489			Maximum Detected		-0.716
19						Mean of Detected	0.153			Mean of Detected		-2.264
20						SD of Detected	0.14			SD of Detected		0.934
21						Minimum Non-Detect	0.0576			Minimum Non-Detect		-2.854
22						Maximum Non-Detect	0.0576			Maximum Non-Detect		-2.854
23												
24												
25						UCL Statistics						
26				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
27						Shapiro Wilk Test Statistic	0.803			Shapiro Wilk Test Statistic		0.977
28						5% Shapiro Wilk Critical Value	0.92			5% Shapiro Wilk Critical Value		0.92
29				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
30												
31				Assuming Normal Distribution						Assuming Lognormal Distribution		
32						DL/2 Substitution Method				DL/2 Substitution Method		
33						Mean	0.149			Mean		-2.311
34						SD	0.139			SD		0.949
35						95% DL/2 (t) UCL	0.194			95% H-Stat (DL/2) UCL		0.245
36												
37						Maximum Likelihood Estimate(MLE) Method				Log ROS Method		
38						Mean	0.126			Mean in Log Scale		-2.307
39						SD	0.164			SD in Log Scale		0.944
40						95% MLE (t) UCL	0.18			Mean in Original Scale		0.149

	A	B	C	D	E	F	G	H	I	J	K	L
41					95% MLE (Tiku) UCL	0.182					SD in Original Scale	0.139
42											95% Percentile Bootstrap UCL	0.194
43											95% BCA Bootstrap UCL	0.201
44												
45				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
46					k star (bias corrected)	1.294				Data appear Gamma Distributed at 5% Significance Level		
47					Theta Star	0.118						
48					nu star	67.3						
49												
50					A-D Test Statistic	0.4				Nonparametric Statistics		
51					5% A-D Critical Value	0.763					Kaplan-Meier (KM) Method	
52					K-S Test Statistic	0.763					Mean	0.149
53					5% K-S Critical Value	0.175					SD	0.136
54				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	0.0268
55											95% KM (t) UCL	0.194
56				Assuming Gamma Distribution							95% KM (z) UCL	0.193
57					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.194
58					Minimum	1E-09					95% KM (bootstrap t) UCL	0.207
59					Maximum	0.489					95% KM (BCA) UCL	0.195
60					Mean	0.148					95% KM (Percentile Bootstrap) UCL	0.194
61					Median	0.102					95% KM (Chebyshev) UCL	0.265
62					SD	0.14					97.5% KM (Chebyshev) UCL	0.316
63					k star	0.556					99% KM (Chebyshev) UCL	0.415
64					Theta star	0.265						
65					Nu star	30.04				Potential UCLs to Use		
66					AppChi2	18.53					95% KM (Chebyshev) UCL	0.265
67					95% Gamma Approximate UCL	0.239						
68					95% Adjusted Gamma UCL	0.247						
69	Note: DL/2 is not a recommended method.											
70												
71												
72	PCBND=1/2DL											
73												
74						General Statistics						
75					Number of Valid Data	27					Number of Detected Data	26
76					Number of Distinct Detected Data	26					Number of Non-Detect Data	1
77											Percent Non-Detects	3.70%
78												
79				Raw Statistics						Log-transformed Statistics		
80					Minimum Detected	0.00902					Minimum Detected	-4.708

	A	B	C	D	E	F	G	H	I	J	K	L
81					Maximum Detected	0.475					Maximum Detected	-0.745
82					Mean of Detected	0.146					Mean of Detected	-2.343
83					SD of Detected	0.138					SD of Detected	0.986
84					Minimum Non-Detect	0.0288					Minimum Non-Detect	-3.547
85					Maximum Non-Detect	0.0288					Maximum Non-Detect	-3.547
86												
87												
88					UCL Statistics							
89			Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only			
90					Shapiro Wilk Test Statistic	0.799					Shapiro Wilk Test Statistic	0.976
91					5% Shapiro Wilk Critical Value	0.92					5% Shapiro Wilk Critical Value	0.92
92			Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level			
93												
94			Assuming Normal Distribution						Assuming Lognormal Distribution			
95					DL/2 Substitution Method						DL/2 Substitution Method	
96					Mean	0.142					Mean	-2.413
97					SD	0.138					SD	1.034
98					95% DL/2 (t) UCL	0.187					95% H-Stat (DL/2) UCL	0.253
99												
100					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
101					Mean	0.134					Mean in Log Scale	-2.41
102					SD	0.146					SD in Log Scale	1.028
103					95% MLE (t) UCL	0.182					Mean in Original Scale	0.142
104					95% MLE (Tiku) UCL	0.18					SD in Original Scale	0.138
105											95% Percentile Bootstrap UCL	0.186
106											95% BCA Bootstrap UCL	0.193
107												
108			Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only			
109					k star (bias corrected)	1.199			Data appear Gamma Distributed at 5% Significance Level			
110					Theta Star	0.122						
111					nu star	62.35						
112												
113					A-D Test Statistic	0.367			Nonparametric Statistics			
114					5% A-D Critical Value	0.766					Kaplan-Meier (KM) Method	
115					K-S Test Statistic	0.766					Mean	0.142
116					5% K-S Critical Value	0.175					SD	0.135
117			Data appear Gamma Distributed at 5% Significance Level								SE of Mean	0.0265
118											95% KM (t) UCL	0.187
119			Assuming Gamma Distribution								95% KM (z) UCL	0.185
120					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.187

	A	B	C	D	E	F	G	H	I	J	K	L
121					Minimum	1E-09					95% KM (bootstrap t) UCL	0.2
122					Maximum	0.475					95% KM (BCA) UCL	0.187
123					Mean	0.141					95% KM (Percentile Bootstrap) UCL	0.186
124					Median	0.0993					95% KM (Chebyshev) UCL	0.257
125					SD	0.138					97.5% KM (Chebyshev) UCL	0.307
126					k star	0.543					99% KM (Chebyshev) UCL	0.405
127					Theta star	0.26						
128					Nu star	29.3					Potential UCLs to Use	
129					AppChi2	17.94					95% KM (Chebyshev) UCL	0.257
130					95% Gamma Approximate UCL	0.23						
131					95% Adjusted Gamma UCL	0.238						
132	Note: DL/2 is not a recommended method.											
133												
134												
135	PCBND=0											
136												
137					General Statistics							
138					Number of Valid Data	27					Number of Detected Data	26
139					Number of Distinct Detected Data	26					Number of Non-Detect Data	1
140											Percent Non-Detects	3.70%
141												
142					Raw Statistics						Log-transformed Statistics	
143					Minimum Detected	0.00638					Log Statistics Not Avaliable	
144					Maximum Detected	0.46						
145					Mean of Detected	0.14						
146					Mean of Detected	0.14						
147					Mean of Detected	0.14						
148					Maximum Non-Detect	0						
149												
150					UCL Statistics							
151					Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only	
152					Shapiro Wilk Test Statistic	0.795					Not Available	
153					5% Shapiro Wilk Critical Value	0.92						
154					Data not Normal at 5% Significance Level							
155												
156					Assuming Normal Distribution						Assuming Lognormal Distribution	
157					DL/2 Substitution Method						DL/2 Substitution Method	N/A
158					Mean	0.135						
159					SD	0.136						
160					95% DL/2 (t) UCL	0.179						

	A	B	C	D	E	F	G	H	I	J	K	L
161												
162					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	N/A
163					Mean	0.132						
164					SD	0.138						
165					95% MLE (t) UCL	0.177						
166					95% MLE (Tiku) UCL	0.175						
167												
168				**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**		
169				Gamma Statistics Not Available						Data appear Gamma Distributed at 5% Significance Level		
170												
171												
172				**Potential UCLs to Use**						**Nonparametric Statistics**		
173					95% KM (BCA) UCL	0.18					Kaplan-Meier (KM) Method	
174											Mean	0.135
175											SD	0.133
176											SE of Mean	0.0262
177											95% KM (t) UCL	0.18
178											95% KM (z) UCL	0.178
179											95% KM (jackknife) UCL	0.179
180											95% KM (bootstrap t) UCL	0.193
181											95% KM (BCA) UCL	0.18
182											95% KM (Percentile Bootstrap) UCL	0.179
183											95% KM (Chebyshev) UCL	0.249
184											97.5% KM (Chebyshev) UCL	0.298
185											99% KM (Chebyshev) UCL	0.395
186	Note: DL/2 is not a recommended method.											
187												

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_1-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_1-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	96	Number of Detected Data	43
Number of Distinct Detected Data	34	Number of Non-Detect Data	53
		Percent Non-Detects	55.21%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.016	Minimum Detected	-4.135
Maximum Detected	0.2	Maximum Detected	-1.609
Mean of Detected	0.0596	Mean of Detected	-3.055
SD of Detected	0.0432	SD of Detected	0.696
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.854	Shapiro Wilk Test Statistic	0.951
5% Shapiro Wilk Critical Value	0.943	5% Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0792	Mean	-2.668
SD	0.0337	SD	0.581
95% DL/2 (t) UCL	0.0849	95% H-Stat (DL/2) UCL	0.166
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.078
		SD in Log Scale	0.663
		Mean in Original Scale	0.0571
		SD in Original Scale	0.0391
		95% Percentile Bootstrap UCL	0.0638
		95% BCA Bootstrap UCL	0.0643

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.134	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0279	
nu star	183.5	
A-D Test Statistic	0.62	
5% A-D Critical Value	0.759	
K-S Test Statistic	0.759	
5% K-S Critical Value	0.136	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.0097	Mean	0.0578
Maximum	0.2	SD	0.0398
Mean	0.0603	SE of Mean	0.00594
Median	0.0602	95% KM (t) UCL	0.0677
SD	0.033	95% KM (z) UCL	0.0676
k star	3.251	95% KM (jackknife) UCL	0.0677
Theta star	0.0185	95% KM (bootstrap t) UCL	0.0688
Nu star	624.3	95% KM (BCA) UCL	0.0675
AppChi2	567.3	95% KM (Percentile Bootstrap) UCL	0.0678
95% Gamma Approximate UCL	0.0663	95% KM (Chebyshev) UCL	0.0837
95% Adjusted Gamma UCL	0.0664	97.5% KM (Chebyshev) UCL	0.0949
		99% KM (Chebyshev) UCL	0.117
		Potential UCLs to Use	
		95% KM (t) UCL	0.0677

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_2-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	96	Number of Detected Data	63
Number of Distinct Detected Data	49	Number of Non-Detect Data	33
		Percent Non-Detects	34.38%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.015	Minimum Detected	-4.2
Maximum Detected	0.35	Maximum Detected	-1.05
Mean of Detected	0.0815	Mean of Detected	-2.863
SD of Detected	0.0747	SD of Detected	0.848
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.187	Lilliefors Test Statistic	0.0976
5% Lilliefors Critical Value	0.112	5% Lilliefors Critical Value	0.112
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0861	Mean	-2.688
SD	0.0607	SD	0.727
95% DL/2 (t) UCL	0.0964	95% H-Stat (DL/2) UCL	0.189
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.283	Mean in Log Scale	-2.917
SD	0.0531	SD in Log Scale	0.797
95% MLE (t) UCL	0.292	Mean in Original Scale	0.0742
95% MLE (Tiku) UCL	0.318	SD in Original Scale	0.0653
		95% Percentile Bootstrap UCL	0.0856
		95% BCA Bootstrap UCL	0.0869

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	1.487	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	0.0548	
nu star	187.4	
A-D Test Statistic	1.078	**Nonparametric Statistics**
5% A-D Critical Value	0.768	Kaplan-Meier (KM) Method
K-S Test Statistic	0.768	Mean 0.0748
5% K-S Critical Value	0.114	SD 0.0656
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean 0.00748
		95% KM (t) UCL 0.0872
Assuming Gamma Distribution		95% KM (z) UCL 0.0871
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.0872
Minimum	0.015	95% KM (bootstrap t) UCL 0.0887
Maximum	0.35	95% KM (BCA) UCL 0.0871
Mean	0.0819	95% KM (Percentile Bootstrap) UCL 0.0877
Median	0.0781	95% KM (Chebyshev) UCL 0.107
SD	0.0606	97.5% KM (Chebyshev) UCL 0.121
k star	2.211	99% KM (Chebyshev) UCL 0.149
Theta star	0.0371	
Nu star	424.5	Potential UCLs to Use
AppChi2	377.8	95% KM (Percentile Bootstrap) UCL 0.0877
95% Gamma Approximate UCL	0.0921	
95% Adjusted Gamma UCL	0.0923	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_ACENAPHTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ACENAPHTHENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	17	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.024	Minimum Detected	-3.73
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.046	Mean of Detected	-3.162
SD of Detected	0.0208	SD of Detected	0.407
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.851	Shapiro Wilk Test Statistic	0.952
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0843	Mean	-2.531
SD	0.0225	SD	0.384
95% DL/2 (t) UCL	0.0881	95% H-Stat (DL/2) UCL	0.127
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.162
		SD in Log Scale	0.42
		Mean in Original Scale	0.0462
		SD in Original Scale	0.0202
		95% Percentile Bootstrap UCL	0.0497
		95% BCA Bootstrap UCL	0.05

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	5.312	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.00866	
nu star	223.1	
A-D Test Statistic	0.424	**Nonparametric Statistics**
5% A-D Critical Value	0.745	Kaplan-Meier (KM) Method
K-S Test Statistic	0.745	Mean 0.046
5% K-S Critical Value	0.19	SD 0.0203
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.00454
		95% KM (t) UCL 0.0535
Assuming Gamma Distribution		95% KM (z) UCL 0.0535
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.0537
Minimum	1E-09	95% KM (bootstrap t) UCL 0.0565
Maximum	0.1	95% KM (BCA) UCL 0.0536
Mean	0.0457	95% KM (Percentile Bootstrap) UCL 0.054
Median	0.0481	95% KM (Chebyshev) UCL 0.0658
SD	0.0183	97.5% KM (Chebyshev) UCL 0.0744
k star	1.642	99% KM (Chebyshev) UCL 0.0912
Theta star	0.0278	
Nu star	315.3	Potential UCLs to Use
AppChi2	275.1	95% KM (t) UCL 0.0535
95% Gamma Approximate UCL	0.0523	
95% Adjusted Gamma UCL	0.0524	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_ACENAPHTHYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ACENAPHTHYLENE

General Statistics

Number of Valid Data	96	Number of Detected Data	22
Number of Distinct Detected Data	19	Number of Non-Detect Data	74
		Percent Non-Detects	77.08%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.011	Minimum Detected	-4.51
Maximum Detected	0.24	Maximum Detected	-1.427
Mean of Detected	0.0691	Mean of Detected	-2.97
SD of Detected	0.0592	SD of Detected	0.79
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.794	Shapiro Wilk Test Statistic	0.981
5% Shapiro Wilk Critical Value	0.911	5% Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0891	Mean	-2.495
SD	0.0299	SD	0.454
95% DL/2 (t) UCL	0.0941	95% H-Stat (DL/2) UCL	0.134
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.095
		SD in Log Scale	0.695
		Mean in Original Scale	0.0573
		SD in Original Scale	0.0423
		95% Percentile Bootstrap UCL	0.0646
		95% BCA Bootstrap UCL	0.0656

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.604	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0431		
nu star	70.59		
A-D Test Statistic	0.394	Nonparametric Statistics	
5% A-D Critical Value	0.757	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.757	Mean	0.0571
5% K-S Critical Value	0.188	SD	0.0397
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00751
		95% KM (t) UCL	0.0696
Assuming Gamma Distribution		95% KM (z) UCL	0.0695
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0698
Minimum	0.011	95% KM (bootstrap t) UCL	0.0713
Maximum	0.24	95% KM (BCA) UCL	0.0694
Mean	0.0687	95% KM (Percentile Bootstrap) UCL	0.0699
Median	0.0675	95% KM (Chebyshev) UCL	0.0898
SD	0.028	97.5% KM (Chebyshev) UCL	0.104
k star	7.138	99% KM (Chebyshev) UCL	0.132
Theta star	0.00962		
Nu star	1371	Potential UCLs to Use	
AppChi2	1286	95% KM (t) UCL	0.0696
95% Gamma Approximate UCL	0.0732		
95% Adjusted Gamma UCL	0.0733		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ALUMINUM

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	46

Raw Statistics

Minimum	22.6
Maximum	90.4
Mean	39.08
Median	34.7
SD	13.35
Coefficient of Variation	0.342
Skewness	2.392

Log-transformed Statistics

Minimum of Log Data	3.118
Maximum of Log Data	4.504
Mean of log Data	3.623
SD of log Data	0.278

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.183
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.129
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	42.21

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	42.82
95% Modified-t UCL	42.32

Assuming Lognormal Distribution

95% H-UCL	41.64
95% Chebyshev (MVUE) UCL	45.6
97.5% Chebyshev (MVUE) UCL	48.5
99% Chebyshev (MVUE) UCL	54.2

Gamma Distribution Test

k star (bias corrected)	11.17
Theta Star	3.498
MLE of Mean	39.08
MLE of Standard Deviation	11.69
nu star	1140
Approximate Chi Square Value (.05)	1062
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	1060
Anderson-Darling Test Statistic	2.189
Anderson-Darling 5% Critical Value	0.749
Kolmogorov-Smirnov Test Statistic	0.143
Kolmogorov-Smirnov 5% Critical Value	0.124

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	41.93
95% Adjusted Gamma UCL	42.01

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	42.16
95% Jackknife UCL	42.21
95% Standard Bootstrap UCL	42.14
95% Bootstrap-t UCL	43.43
95% Hall's Bootstrap UCL	44.01
95% Percentile Bootstrap UCL	42.25
95% BCA Bootstrap UCL	42.8
95% Chebyshev(Mean, Sd) UCL	47.23
97.5% Chebyshev(Mean, Sd) UCL	50.75
99% Chebyshev(Mean, Sd) UCL	57.68

Potential UCL to Use

Use 95% Student's-t UCL	42.21
or 95% Modified-t UCL	42.32

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_ANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ANTHRACENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	19	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0084	Minimum Detected	-4.78
Maximum Detected	1.8	Maximum Detected	0.588
Mean of Detected	0.23	Mean of Detected	-2.688
SD of Detected	0.441	SD of Detected	1.493
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.556	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.125	Mean	-2.427
SD	0.21	SD	0.699
95% DL/2 (t) UCL	0.16	95% H-Stat (DL/2) UCL	0.171
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.109
		SD in Log Scale	1.231
		Mean in Original Scale	0.104
		SD in Original Scale	0.223
		95% Percentile Bootstrap UCL	0.146
		95% BCA Bootstrap UCL	0.162

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.476	Data appear Lognormal at 5% Significance Level	
Theta Star	0.485		
nu star	19.97		
A-D Test Statistic	1.701	Nonparametric Statistics	
5% A-D Critical Value	0.804	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.804	Mean	0.0917
5% K-S Critical Value	0.2	SD	0.218
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0249
		95% KM (t) UCL	0.133
Assuming Gamma Distribution		95% KM (z) UCL	0.133
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.133
Minimum	1E-09	95% KM (bootstrap t) UCL	0.16
Maximum	1.8	95% KM (BCA) UCL	0.137
Mean	0.211	95% KM (Percentile Bootstrap) UCL	0.135
Median	0.199	95% KM (Chebyshev) UCL	0.2
SD	0.229	97.5% KM (Chebyshev) UCL	0.247
k star	0.343	99% KM (Chebyshev) UCL	0.34
Theta star	0.616		
Nu star	65.85	Potential UCLs to Use	
AppChi2	48.18	95% KM (BCA) UCL	0.137
95% Gamma Approximate UCL	0.289		
95% Adjusted Gamma UCL	0.29		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ANTIMONY

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	20

Raw Statistics

Minimum	0.13
Maximum	0.32
Mean	0.197
Median	0.18
SD	0.0488
Coefficient of Variation	0.247
Skewness	0.967

Log-transformed Statistics

Minimum of Log Data	-2.04
Maximum of Log Data	-1.139
Mean of log Data	-1.651
SD of log Data	0.233

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.163
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.129
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.209

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.209
95% Modified-t UCL	0.209

Assuming Lognormal Distribution

95% H-UCL	0.209
95% Chebyshev (MVUE) UCL	0.225
97.5% Chebyshev (MVUE) UCL	0.237
99% Chebyshev (MVUE) UCL	0.262

Gamma Distribution Test

k star (bias corrected)	17.26
Theta Star	0.0114
MLE of Mean	0.197
MLE of Standard Deviation	0.0474
nu star	1761
Approximate Chi Square Value (.05)	1665
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	1662
Anderson-Darling Test Statistic	1.013
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.137
Kolmogorov-Smirnov 5% Critical Value	0.124

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.209
95% Adjusted Gamma UCL	0.209

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	0.208
95% Jackknife UCL	0.209
95% Standard Bootstrap UCL	0.208
95% Bootstrap-t UCL	0.21
95% Hall's Bootstrap UCL	0.209
95% Percentile Bootstrap UCL	0.208
95% BCA Bootstrap UCL	0.209
95% Chebyshev(Mean, Sd) UCL	0.227
97.5% Chebyshev(Mean, Sd) UCL	0.24
99% Chebyshev(Mean, Sd) UCL	0.265

Potential UCL to Use

Use 95% Student's-t UCL	0.209
or 95% Modified-t UCL	0.209

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ARSENIC

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	30

Raw Statistics

Minimum	2.6
Maximum	7.6
Mean	4.097
Median	3.6
SD	1.188
Coefficient of Variation	0.29
Skewness	1.124

Log-transformed Statistics

Minimum of Log Data	0.956
Maximum of Log Data	2.028
Mean of log Data	1.373
SD of log Data	0.268

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.192
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.164
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	4.376

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4.399
95% Modified-t UCL	4.38

Assuming Lognormal Distribution

95% H-UCL	4.369
95% Chebyshev (MVUE) UCL	4.77
97.5% Chebyshev (MVUE) UCL	5.064
99% Chebyshev (MVUE) UCL	5.642

Gamma Distribution Test

k star (bias corrected)	12.9
Theta Star	0.318
MLE of Mean	4.097
MLE of Standard Deviation	1.141
nu star	1316
Approximate Chi Square Value (.05)	1233
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	1230
Anderson-Darling Test Statistic	1.143
Anderson-Darling 5% Critical Value	0.749
Kolmogorov-Smirnov Test Statistic	0.176
Kolmogorov-Smirnov 5% Critical Value	0.124

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	4.374
95% Adjusted Gamma UCL	4.382

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	4.371
95% Jackknife UCL	4.376
95% Standard Bootstrap UCL	4.369
95% Bootstrap-t UCL	4.415
95% Hall's Bootstrap UCL	4.413
95% Percentile Bootstrap UCL	4.375
95% BCA Bootstrap UCL	4.39
95% Chebyshev(Mean, Sd) UCL	4.822
97.5% Chebyshev(Mean, Sd) UCL	5.136
99% Chebyshev(Mean, Sd) UCL	5.752

Potential UCL to Use

Use 95% Student's-t UCL	4.376
or 95% Modified-t UCL	4.38

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_BENZENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZENE

General Statistics

Number of Valid Data	96	Number of Detected Data	50
Number of Distinct Detected Data	40	Number of Non-Detect Data	46
		Percent Non-Detects	47.92%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1	Minimum Detected	0
Maximum Detected	72	Maximum Detected	4.277
Mean of Detected	11.05	Mean of Detected	1.629
SD of Detected	16.15	SD of Detected	1.209
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.645	Shapiro Wilk Test Statistic	0.929
5% Shapiro Wilk Critical Value	0.947	5% Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.952	Mean	1.287
SD	12.37	SD	0.939
95% DL/2 (t) UCL	9.048	95% H-Stat (DL/2) UCL	8.796
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	1.225
		SD in Log Scale	1.113
		Mean in Original Scale	7.13
		SD in Original Scale	12.37
		95% Percentile Bootstrap UCL	9.328
		95% BCA Bootstrap UCL	9.882

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.738	Data do not follow a Discernable Distribution (0.05)
Theta Star	14.97	
nu star	73.8	
A-D Test Statistic	2.261	**Nonparametric Statistics**
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method
K-S Test Statistic	0.792	Mean 6.902
5% K-S Critical Value	0.13	SD 12.35
Data not Gamma Distributed at 5% Significance Level		SE of Mean 1.28
		95% KM (t) UCL 9.029
Assuming Gamma Distribution		95% KM (z) UCL 9.008
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 9.02
Minimum	1	95% KM (bootstrap t) UCL 9.787
Maximum	72	95% KM (BCA) UCL 9.215
Mean	10.86	95% KM (Percentile Bootstrap) UCL 9.125
Median	9.9	95% KM (Chebyshev) UCL 12.48
SD	11.62	97.5% KM (Chebyshev) UCL 14.9
k star	1.341	99% KM (Chebyshev) UCL 19.64
Theta star	8.1	
Nu star	257.4	Potential UCLs to Use
AppChi2	221.2	95% KM (Chebyshev) UCL 12.48
95% Gamma Approximate UCL	12.63	
95% Adjusted Gamma UCL	12.66	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_BENZOAANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZO(A)ANTHRACENE

General Statistics

Number of Valid Data	96	Number of Detected Data	20
Number of Distinct Detected Data	19	Number of Non-Detect Data	76
		Percent Non-Detects	79.17%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.058	Minimum Detected	-2.847
Maximum Detected	8.7	Maximum Detected	2.163
Mean of Detected	1.437	Mean of Detected	-1.214
SD of Detected	2.706	SD of Detected	1.717
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.57	Shapiro Wilk Test Statistic	0.822
5% Shapiro Wilk Critical Value	0.905	5% Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.375	Mean	-2.116
SD	1.328	SD	0.898
95% DL/2 (t) UCL	0.6	95% H-Stat (DL/2) UCL	0.238
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.117
		SD in Log Scale	1.309
		Mean in Original Scale	0.421
		SD in Original Scale	1.325
		95% Percentile Bootstrap UCL	0.663
		95% BCA Bootstrap UCL	0.759

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.386	Data do not follow a Discernable Distribution (0.05)
Theta Star	3.722	
nu star	15.44	
A-D Test Statistic	2.336	**Nonparametric Statistics**
5% A-D Critical Value	0.82	Kaplan-Meier (KM) Method
K-S Test Statistic	0.82	Mean 0.375
5% K-S Critical Value	0.207	SD 1.322
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.139
		95% KM (t) UCL 0.606
Assuming Gamma Distribution		95% KM (z) UCL 0.604
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.601
Minimum	1E-09	95% KM (bootstrap t) UCL 0.791
Maximum	8.7	95% KM (BCA) UCL 0.639
Mean	1.183	95% KM (Percentile Bootstrap) UCL 0.625
Median	1.146	95% KM (Chebyshev) UCL 0.98
SD	1.388	97.5% KM (Chebyshev) UCL 1.242
k star	0.207	99% KM (Chebyshev) UCL 1.756
Theta star	5.729	
Nu star	39.65	Potential UCLs to Use
AppChi2	26.23	95% KM (Chebyshev) UCL 0.98
95% Gamma Approximate UCL	1.789	
95% Adjusted Gamma UCL	1.8	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_BENZOAPYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZO(A)PYRENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	19	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.034	Minimum Detected	-3.381
Maximum Detected	6.8	Maximum Detected	1.917
Mean of Detected	1.055	Mean of Detected	-1.526
SD of Detected	2.046	SD of Detected	1.698
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.555	Shapiro Wilk Test Statistic	0.842
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.305	Mean	-2.173
SD	1.02	SD	0.852
95% DL/2 (t) UCL	0.478	95% H-Stat (DL/2) UCL	0.222
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.303
		SD in Log Scale	1.309
		Mean in Original Scale	0.335
		SD in Original Scale	1.02
		95% Percentile Bootstrap UCL	0.518
		95% BCA Bootstrap UCL	0.583

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.387	Data do not follow a Discernable Distribution (0.05)
Theta Star	2.727	
nu star	16.24	
A-D Test Statistic	2.432	**Nonparametric Statistics**
5% A-D Critical Value	0.823	Kaplan-Meier (KM) Method
K-S Test Statistic	0.823	Mean 0.294
5% K-S Critical Value	0.203	SD 1.018
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.107
		95% KM (t) UCL 0.471
Assuming Gamma Distribution		95% KM (z) UCL 0.47
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.468
Minimum	1E-09	95% KM (bootstrap t) UCL 0.632
Maximum	6.8	95% KM (BCA) UCL 0.483
Mean	0.902	95% KM (Percentile Bootstrap) UCL 0.487
Median	0.867	95% KM (Chebyshev) UCL 0.759
SD	1.068	97.5% KM (Chebyshev) UCL 0.961
k star	0.218	99% KM (Chebyshev) UCL 1.356
Theta star	4.138	
Nu star	41.85	Potential UCLs to Use
AppChi2	28.02	95% KM (Chebyshev) UCL 0.759
95% Gamma Approximate UCL	1.347	
95% Adjusted Gamma UCL	1.356	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_BENZOBFLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	19	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.016	Minimum Detected	-4.135
Maximum Detected	8	Maximum Detected	2.079
Mean of Detected	1.4	Mean of Detected	-1.337
SD of Detected	2.633	SD of Detected	1.819
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.567	Shapiro Wilk Test Statistic	0.881
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.381	Mean	-2.131
SD	1.324	SD	0.936
95% DL/2 (t) UCL	0.605	95% H-Stat (DL/2) UCL	0.252
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.19
		SD in Log Scale	1.425
		Mean in Original Scale	0.431
		SD in Original Scale	1.322
		95% Percentile Bootstrap UCL	0.677
		95% BCA Bootstrap UCL	0.769

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.37	Data do not follow a Discernable Distribution (0.05)
Theta Star	3.789	
nu star	15.52	
A-D Test Statistic	2.207	
5% A-D Critical Value	0.827	
K-S Test Statistic	0.827	
5% K-S Critical Value	0.203	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.381
Maximum	8	SD	1.318
Mean	1.204	SE of Mean	0.138
Median	1.18	95% KM (t) UCL	0.611
SD	1.382	95% KM (z) UCL	0.608
k star	0.215	95% KM (jackknife) UCL	0.606
Theta star	5.596	95% KM (bootstrap t) UCL	0.821
Nu star	41.31	95% KM (BCA) UCL	0.64
AppChi2	27.58	95% KM (Percentile Bootstrap) UCL	0.618
95% Gamma Approximate UCL	1.804	95% KM (Chebyshev) UCL	0.984
95% Adjusted Gamma UCL	1.815	97.5% KM (Chebyshev) UCL	1.245
		99% KM (Chebyshev) UCL	1.757
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	0.984

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_BENZOGHIPERYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZO(GHI)PERYLENE

General Statistics

Number of Valid Data	96	Number of Detected Data	22
Number of Distinct Detected Data	21	Number of Non-Detect Data	74
		Percent Non-Detects	77.08%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.017	Minimum Detected	-4.075
Maximum Detected	9.6	Maximum Detected	2.262
Mean of Detected	1.56	Mean of Detected	-1.16
SD of Detected	2.995	SD of Detected	1.777
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.557	Shapiro Wilk Test Statistic	0.912
5% Shapiro Wilk Critical Value	0.911	5% Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.431	Mean	-2.08
SD	1.538	SD	0.976
95% DL/2 (t) UCL	0.691	95% H-Stat (DL/2) UCL	0.274
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.217
		SD in Log Scale	1.444
		Mean in Original Scale	0.464
		SD in Original Scale	1.535
		95% Percentile Bootstrap UCL	0.743
		95% BCA Bootstrap UCL	0.837

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.383	Data appear Lognormal at 5% Significance Level	
Theta Star	4.069		
nu star	16.87		
A-D Test Statistic	2.05	Nonparametric Statistics	
5% A-D Critical Value	0.824	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.824	Mean	0.433
5% K-S Critical Value	0.198	SD	1.53
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.16
		95% KM (t) UCL	0.7
Assuming Gamma Distribution		95% KM (z) UCL	0.697
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.695
Minimum	1E-09	95% KM (bootstrap t) UCL	0.957
Maximum	9.6	95% KM (BCA) UCL	0.717
Mean	1.267	95% KM (Percentile Bootstrap) UCL	0.713
Median	1.162	95% KM (Chebyshev) UCL	1.132
SD	1.576	97.5% KM (Chebyshev) UCL	1.434
k star	0.214	99% KM (Chebyshev) UCL	2.028
Theta star	5.916		
Nu star	41.12	Potential UCLs to Use	
AppChi2	27.43	95% KM (Chebyshev) UCL	1.132
95% Gamma Approximate UCL	1.9		
95% Adjusted Gamma UCL	1.912		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_BENZOKFLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_BENZO(K)FLUORANTHENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	20	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.021	Minimum Detected	-3.863
Maximum Detected	9.2	Maximum Detected	2.219
Mean of Detected	1.471	Mean of Detected	-1.121
SD of Detected	2.686	SD of Detected	1.733
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.59	Shapiro Wilk Test Statistic	0.907
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.396	Mean	-2.084
SD	1.359	SD	0.946
95% DL/2 (t) UCL	0.626	95% H-Stat (DL/2) UCL	0.26
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.213
		SD in Log Scale	1.406
		Mean in Original Scale	0.429
		SD in Original Scale	1.356
		95% Percentile Bootstrap UCL	0.677
		95% BCA Bootstrap UCL	0.77

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.402	Data do not follow a Discernable Distribution (0.05)
Theta Star	3.665	
nu star	16.86	
A-D Test Statistic	1.951	**Nonparametric Statistics**
5% A-D Critical Value	0.819	Kaplan-Meier (KM) Method
K-S Test Statistic	0.819	Mean 0.402
5% K-S Critical Value	0.202	SD 1.351
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.142
		95% KM (t) UCL 0.638
Assuming Gamma Distribution		95% KM (z) UCL 0.636
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.634
Minimum	1E-09	95% KM (bootstrap t) UCL 0.826
Maximum	9.2	95% KM (BCA) UCL 0.657
Mean	1.169	95% KM (Percentile Bootstrap) UCL 0.653
Median	1.073	95% KM (Chebyshev) UCL 1.021
SD	1.402	97.5% KM (Chebyshev) UCL 1.289
k star	0.207	99% KM (Chebyshev) UCL 1.815
Theta star	5.651	
Nu star	39.72	Potential UCLs to Use
AppChi2	26.28	95% KM (Chebyshev) UCL 1.021
95% Gamma Approximate UCL	1.767	
95% Adjusted Gamma UCL	1.778	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_CHROMIUM

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	17

Raw Statistics

Minimum	2.1
Maximum	4.9
Mean	3.595
Median	3.6
SD	0.449
Coefficient of Variation	0.125
Skewness	-0.547

Log-transformed Statistics

Minimum of Log Data	0.742
Maximum of Log Data	1.589
Mean of log Data	1.271
SD of log Data	0.135

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.138
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.166
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	3.7

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	3.693
95% Modified-t UCL	3.7

Assuming Lognormal Distribution

95% H-UCL	3.716
95% Chebyshev (MVUE) UCL	3.894
97.5% Chebyshev (MVUE) UCL	4.022
99% Chebyshev (MVUE) UCL	4.275

Gamma Distribution Test

k star (bias corrected)	56.25
Theta Star	0.0639
MLE of Mean	3.595
MLE of Standard Deviation	0.479
nu star	5738
Approximate Chi Square Value (.05)	5563
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	5558
Anderson-Darling Test Statistic	1.367
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.154
Kolmogorov-Smirnov 5% Critical Value	0.124

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	3.708
95% Adjusted Gamma UCL	3.712

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	3.699
95% Jackknife UCL	3.7
95% Standard Bootstrap UCL	3.698
95% Bootstrap-t UCL	3.698
95% Hall's Bootstrap UCL	3.7
95% Percentile Bootstrap UCL	3.696
95% BCA Bootstrap UCL	3.691
95% Chebyshev(Mean, Sd) UCL	3.869
97.5% Chebyshev(Mean, Sd) UCL	3.988
99% Chebyshev(Mean, Sd) UCL	4.221

Potential UCL to Use

Use 95% Student's-t UCL 3.7

or 95% Modified-t UCL 3.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_CHRYSENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_CHRYSENE

General Statistics

Number of Valid Data	96	Number of Detected Data	20
Number of Distinct Detected Data	18	Number of Non-Detect Data	76
		Percent Non-Detects	79.17%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	9.6	Maximum Detected	2.262
Mean of Detected	1.626	Mean of Detected	-1.057
SD of Detected	2.95	SD of Detected	1.723
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.594	Shapiro Wilk Test Statistic	0.833
5% Shapiro Wilk Critical Value	0.905	5% Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.414	Mean	-2.084
SD	1.46	SD	0.935
95% DL/2 (t) UCL	0.661	95% H-Stat (DL/2) UCL	0.254
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.06
		SD in Log Scale	1.332
		Mean in Original Scale	0.464
		SD in Original Scale	1.455
		95% Percentile Bootstrap UCL	0.726
		95% BCA Bootstrap UCL	0.823

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.393	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.143	
nu star	15.7	
A-D Test Statistic	2.233	**Nonparametric Statistics**
5% A-D Critical Value	0.819	Kaplan-Meier (KM) Method
K-S Test Statistic	0.819	Mean 0.421
5% K-S Critical Value	0.207	SD 1.451
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.152
		95% KM (t) UCL 0.674
Assuming Gamma Distribution		95% KM (z) UCL 0.672
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.669
Minimum	1E-09	95% KM (bootstrap t) UCL 0.874
Maximum	9.6	95% KM (BCA) UCL 0.695
Mean	1.303	95% KM (Percentile Bootstrap) UCL 0.691
Median	1.238	95% KM (Chebyshev) UCL 1.085
SD	1.52	97.5% KM (Chebyshev) UCL 1.373
k star	0.205	99% KM (Chebyshev) UCL 1.937
Theta star	6.346	
Nu star	39.43	Potential UCLs to Use
AppChi2	26.04	95% KM (Chebyshev) UCL 1.085
95% Gamma Approximate UCL	1.973	
95% Adjusted Gamma UCL	1.986	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_COBALT.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COBALT

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	21

Raw Statistics

Minimum	0.28
Maximum	0.52
Mean	0.378
Median	0.38
SD	0.0692
Coefficient of Variation	0.183
Skewness	0.226

Log-transformed Statistics

Minimum of Log Data	-1.273
Maximum of Log Data	-0.654
Mean of log Data	-0.989
SD of log Data	0.183

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.168
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.154
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.394

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.394
95% Modified-t UCL	0.394

Assuming Lognormal Distribution

95% H-UCL	0.395
95% Chebyshev (MVUE) UCL	0.42
97.5% Chebyshev (MVUE) UCL	0.439
99% Chebyshev (MVUE) UCL	0.475

Gamma Distribution Test

k star (bias corrected)	28.84
Theta Star	0.0131
MLE of Mean	0.378
MLE of Standard Deviation	0.0704
nu star	2942
Approximate Chi Square Value (.05)	2817
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	2813
Anderson-Darling Test Statistic	1.397
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.161
Kolmogorov-Smirnov 5% Critical Value	0.124

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.395
95% Adjusted Gamma UCL	0.395

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	0.394
95% Jackknife UCL	0.394
95% Standard Bootstrap UCL	0.394
95% Bootstrap-t UCL	0.394
95% Hall's Bootstrap UCL	0.394
95% Percentile Bootstrap UCL	0.394
95% BCA Bootstrap UCL	0.394
95% Chebyshev(Mean, Sd) UCL	0.42
97.5% Chebyshev(Mean, Sd) UCL	0.438
99% Chebyshev(Mean, Sd) UCL	0.474

Potential UCL to Use

Use 95% Student's-t UCL	0.394
or 95% Modified-t UCL	0.394

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COPPER

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	13

Raw Statistics

Minimum	1.8
Maximum	2.9
Mean	2.27
Median	2.3
SD	0.293
Coefficient of Variation	0.129
Skewness	0.375

Log-transformed Statistics

Minimum of Log Data	0.588
Maximum of Log Data	1.065
Mean of log Data	0.812
SD of log Data	0.128

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.15
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.138
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	2.338

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2.34
95% Modified-t UCL	2.339

Assuming Lognormal Distribution

95% H-UCL	2.341
95% Chebyshev (MVUE) UCL	2.448
97.5% Chebyshev (MVUE) UCL	2.525
99% Chebyshev (MVUE) UCL	2.676

Gamma Distribution Test

k star (bias corrected)	58.38
Theta Star	0.0389
MLE of Mean	2.27
MLE of Standard Deviation	0.297
nu star	5954
Approximate Chi Square Value (.05)	5776
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	5771
Anderson-Darling Test Statistic	0.669
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.144
Kolmogorov-Smirnov 5% Critical Value	0.124

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	2.34
95% Adjusted Gamma UCL	2.342

Data Distribution

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	2.337
95% Jackknife UCL	2.338
95% Standard Bootstrap UCL	2.337
95% Bootstrap-t UCL	2.341
95% Hall's Bootstrap UCL	2.34
95% Percentile Bootstrap UCL	2.338
95% BCA Bootstrap UCL	2.339
95% Chebyshev(Mean, Sd) UCL	2.449
97.5% Chebyshev(Mean, Sd) UCL	2.526
99% Chebyshev(Mean, Sd) UCL	2.678

Potential UCL to Use

Use 95% Approximate Gamma UCL 2.34

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_DIBENZOAHANTHRACEN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	96	Number of Detected Data	21
Number of Distinct Detected Data	20	Number of Non-Detect Data	75
		Percent Non-Detects	78.13%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	11	Maximum Detected	2.398
Mean of Detected	1.771	Mean of Detected	-1.019
SD of Detected	3.335	SD of Detected	1.752
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.574	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.462	Mean	-2.062
SD	1.681	SD	0.977
95% DL/2 (t) UCL	0.747	95% H-Stat (DL/2) UCL	0.275
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.198
		SD in Log Scale	1.425
		Mean in Original Scale	0.492
		SD in Original Scale	1.678
		95% Percentile Bootstrap UCL	0.796
		95% BCA Bootstrap UCL	0.905

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.385	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.606	
nu star	16.15	
A-D Test Statistic	2.11	**Nonparametric Statistics**
5% A-D Critical Value	0.823	Kaplan-Meier (KM) Method
K-S Test Statistic	0.823	Mean 0.456
5% K-S Critical Value	0.203	SD 1.674
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.175
		95% KM (t) UCL 0.747
Assuming Gamma Distribution		95% KM (z) UCL 0.744
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.742
Minimum	1E-09	95% KM (bootstrap t) UCL 1.013
Maximum	11	95% KM (BCA) UCL 0.791
Mean	1.383	95% KM (Percentile Bootstrap) UCL 0.76
Median	1.27	95% KM (Chebyshev) UCL 1.22
SD	1.724	97.5% KM (Chebyshev) UCL 1.55
k star	0.204	99% KM (Chebyshev) UCL 2.2
Theta star	6.787	
Nu star	39.13	Potential UCLs to Use
AppChi2	25.81	95% KM (Chebyshev) UCL 1.22
95% Gamma Approximate UCL	2.098	
95% Adjusted Gamma UCL	2.112	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_ETHYLBENZENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ETHYLBENZENE

General Statistics

Number of Valid Data	96	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	87
		Percent Non-Detects	90.63%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.74	Minimum Detected	-0.301
Maximum Detected	40	Maximum Detected	3.689
Mean of Detected	5.601	Mean of Detected	0.554
SD of Detected	12.91	SD of Detected	1.254
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

Warning: There are only 9 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.431	Shapiro Wilk Test Statistic	0.693
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.791	Mean	0.882
SD	3.856	SD	0.379
95% DL/2 (t) UCL	3.444	95% H-Stat (DL/2) UCL	3.149
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.284
		SD in Log Scale	0.983
		Mean in Original Scale	2.317
		SD in Original Scale	4.321
		95% Percentile Bootstrap UCL	3.122
		95% BCA Bootstrap UCL	3.551

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.432	Data do not follow a Discernable Distribution (0.05)	
Theta Star	12.95		
nu star	7.784		
A-D Test Statistic	1.854	**Nonparametric Statistics**	
5% A-D Critical Value	0.768	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.768	Mean	1.704
5% K-S Critical Value	0.293	SD	3.976
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.483
		95% KM (t) UCL	2.506
Assuming Gamma Distribution		95% KM (z) UCL	2.498
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.488
Minimum	1E-09	95% KM (bootstrap t) UCL	3.695
Maximum	40	95% KM (BCA) UCL	2.593
Mean	5.311	95% KM (Percentile Bootstrap) UCL	2.554
Median	5.721	95% KM (Chebyshev) UCL	3.809
SD	4.987	97.5% KM (Chebyshev) UCL	4.719
k star	0.204	99% KM (Chebyshev) UCL	6.508
Theta star	26		
Nu star	39.22	Potential UCLs to Use	
AppChi2	25.87	95% KM (BCA) UCL	2.593
95% Gamma Approximate UCL	8.051		
95% Adjusted Gamma UCL	8.103		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_FLUORANTHENE

General Statistics

Number of Valid Data	96	Number of Detected Data	50
Number of Distinct Detected Data	31	Number of Non-Detect Data	46
		Percent Non-Detects	47.92%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	4.7	Maximum Detected	1.548
Mean of Detected	0.259	Mean of Detected	-3.18
SD of Detected	0.858	SD of Detected	1.399
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.322	Shapiro Wilk Test Statistic	0.731
5% Shapiro Wilk Critical Value	0.947	5% Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.18	Mean	-2.784
SD	0.621	SD	1.087
95% DL/2 (t) UCL	0.286	95% H-Stat (DL/2) UCL	0.33
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.317
		SD in Log Scale	1.22
		Mean in Original Scale	0.158
		SD in Original Scale	0.626
		95% Percentile Bootstrap UCL	0.272
		95% BCA Bootstrap UCL	0.328

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.357	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.725	
nu star	35.67	
A-D Test Statistic	9.976	**Nonparametric Statistics**
5% A-D Critical Value	0.847	Kaplan-Meier (KM) Method
K-S Test Statistic	0.847	Mean 0.151
5% K-S Critical Value	0.135	SD 0.623
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.0643
		95% KM (t) UCL 0.258
Assuming Gamma Distribution		95% KM (z) UCL 0.257
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.258
Minimum	1E-09	95% KM (bootstrap t) UCL 0.356
Maximum	4.7	95% KM (BCA) UCL 0.268
Mean	0.255	95% KM (Percentile Bootstrap) UCL 0.267
Median	0.0687	95% KM (Chebyshev) UCL 0.432
SD	0.624	97.5% KM (Chebyshev) UCL 0.553
k star	0.313	99% KM (Chebyshev) UCL 0.791
Theta star	0.814	
Nu star	60.18	Potential UCLs to Use
AppChi2	43.34	95% KM (Chebyshev) UCL 0.432
95% Gamma Approximate UCL	0.354	
95% Adjusted Gamma UCL	0.356	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_FLUORENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_FLUORENE

General Statistics

Number of Valid Data	96	Number of Detected Data	40
Number of Distinct Detected Data	32	Number of Non-Detect Data	56
		Percent Non-Detects	58.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.019	Minimum Detected	-3.963
Maximum Detected	0.15	Maximum Detected	-1.897
Mean of Detected	0.0526	Mean of Detected	-3.079
SD of Detected	0.0306	SD of Detected	0.501
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.817	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.94	5% Shapiro Wilk Critical Value	0.94
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0773	Mean	-2.656
SD	0.0288	SD	0.482
95% DL/2 (t) UCL	0.0822	95% H-Stat (DL/2) UCL	0.152
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.079
		SD in Log Scale	0.495
		Mean in Original Scale	0.0521
		SD in Original Scale	0.0281
		95% Percentile Bootstrap UCL	0.0569
		95% BCA Bootstrap UCL	0.0573

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	3.628	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.0145	
nu star	290.3	
A-D Test Statistic	1.49	**Nonparametric Statistics**
5% A-D Critical Value	0.753	Kaplan-Meier (KM) Method
K-S Test Statistic	0.753	Mean 0.0526
5% K-S Critical Value	0.14	SD 0.0302
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.00484
		95% KM (t) UCL 0.0606
Assuming Gamma Distribution		95% KM (z) UCL 0.0605
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.0607
Minimum	1E-09	95% KM (bootstrap t) UCL 0.0627
Maximum	0.15	95% KM (BCA) UCL 0.0609
Mean	0.0526	95% KM (Percentile Bootstrap) UCL 0.0607
Median	0.0498	95% KM (Chebyshev) UCL 0.0737
SD	0.0265	97.5% KM (Chebyshev) UCL 0.0828
k star	1.154	99% KM (Chebyshev) UCL 0.101
Theta star	0.0456	
Nu star	221.6	Potential UCLs to Use
AppChi2	188.2	95% KM (t) UCL 0.0606
95% Gamma Approximate UCL	0.062	95% KM (% Bootstrap) UCL 0.0607
95% Adjusted Gamma UCL	0.0621	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_CPOA-SW_N_HPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_HPAHND0

General Statistics

Number of Valid Data	96	Number of Detected Data	30
Number of Distinct Detected Data	30	Number of Non-Detect Data	66
		Percent Non-Detects	68.75%

Raw Statistics		Log-transformed Statistics
Minimum Detected	0.011	Log Statistics Not Avaliable
Maximum Detected	75.9	
Mean of Detected	8.786	
Mean of Detected	8.786	
Mean of Detected	8.786	
Maximum Non-Detect	0	

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.48	Not Available	
5% Shapiro Wilk Critical Value	0.927		
Data not Normal at 5% Significance Level			

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	N/A
Mean	2.746		
SD	12.04		
95% DL/2 (t) UCL	4.787		
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	N/A
Mean	-15.64		
SD	24.92		
95% MLE (t) UCL	-11.42		
95% MLE (Tiku) UCL	-8.196		

Gamma Distribution Test with Detected Values Only	Data Distribution Test with Detected Values Only
Gamma Statistics Not Available	Data appear Lognormal at 5% Significance Level

Potential UCLs to Use		Nonparametric Statistics	
97.5% KM (Chebyshev) UCL	10.52	Kaplan-Meier (KM) Method	
		Mean	2.753
		SD	11.98
		SE of Mean	1.243
		95% KM (t) UCL	4.819
		95% KM (z) UCL	4.798
		95% KM (jackknife) UCL	4.794
		95% KM (bootstrap t) UCL	6.58
		95% KM (BCA) UCL	5.007
		95% KM (Percentile Bootstrap) UCL	4.907
		95% KM (Chebyshev) UCL	8.173
		97.5% KM (Chebyshev) UCL	10.52
		99% KM (Chebyshev) UCL	15.12

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_CPOA-SW_N_HPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_HPAHNDDL

General Statistics

Number of Valid Data	96	Number of Detected Data	94
Number of Distinct Detected Data	31	Number of Non-Detect Data	2
		Percent Non-Detects	2.08%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.424	Minimum Detected	-0.858
Maximum Detected	75.9	Maximum Detected	4.329
Mean of Detected	3.986	Mean of Detected	0.629
SD of Detected	11.68	SD of Detected	0.779
Minimum Non-Detect	1.71	Minimum Non-Detect	0.536
Maximum Non-Detect	1.71	Maximum Non-Detect	0.536

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.488	Lilliefors Test Statistic	0.452
5% Lilliefors Critical Value	0.0914	5% Lilliefors Critical Value	0.0914
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.92	Mean	0.613
SD	11.56	SD	0.779
95% DL/2 (t) UCL	5.88	95% H-Stat (DL/2) UCL	3.016
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.449	Mean in Log Scale	0.615
SD	13.45	SD in Log Scale	0.777
95% MLE (t) UCL	3.73	Mean in Original Scale	3.923
95% MLE (Tiku) UCL	3.728	SD in Original Scale	11.56
		95% Percentile Bootstrap UCL	5.99
		95% BCA Bootstrap UCL	6.727

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.771	Data do not follow a Discernable Distribution (0.05)	
Theta Star	5.171		
nu star	144.9		
A-D Test Statistic	26.84	**Nonparametric Statistics**	
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.792	Mean	3.928
5% K-S Critical Value	0.0958	SD	11.5
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.18
		95% KM (t) UCL	5.888
Assuming Gamma Distribution		95% KM (z) UCL	5.869
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.888
Minimum	1E-09	95% KM (bootstrap t) UCL	7.552
Maximum	75.9	95% KM (BCA) UCL	6.125
Mean	3.903	95% KM (Percentile Bootstrap) UCL	6.049
Median	1.71	95% KM (Chebyshev) UCL	9.071
SD	11.57	97.5% KM (Chebyshev) UCL	11.3
k star	0.524	99% KM (Chebyshev) UCL	15.67
Theta star	7.444		
Nu star	100.7	Potential UCLs to Use	
AppChi2	78.51	95% KM (BCA) UCL	6.125
95% Gamma Approximate UCL	5.003		
95% Adjusted Gamma UCL	5.022		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_INDENO123-CDPYREN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_INDENO(1,2,3-CD)PYRENE

General Statistics

Number of Valid Data	96	Number of Detected Data	23
Number of Distinct Detected Data	19	Number of Non-Detect Data	73
		Percent Non-Detects	76.04%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.019	Minimum Detected	-3.963
Maximum Detected	9.9	Maximum Detected	2.293
Mean of Detected	1.541	Mean of Detected	-1.3
SD of Detected	3.034	SD of Detected	1.874
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.55	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.914	5% Shapiro Wilk Critical Value	0.914
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.441	Mean	-2.101
SD	1.586	SD	1.009
95% DL/2 (t) UCL	0.71	95% H-Stat (DL/2) UCL	0.289
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.369
		SD in Log Scale	1.537
		Mean in Original Scale	0.464
		SD in Original Scale	1.585
		95% Percentile Bootstrap UCL	0.752
		95% BCA Bootstrap UCL	0.852

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.362	Data appear Lognormal at 5% Significance Level	
Theta Star	4.26		
nu star	16.64		
A-D Test Statistic	2.011	Nonparametric Statistics	
5% A-D Critical Value	0.831	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.831	Mean	0.435
5% K-S Critical Value	0.195	SD	1.58
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.165
		95% KM (t) UCL	0.71
Assuming Gamma Distribution		95% KM (z) UCL	0.707
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.705
Minimum	1E-09	95% KM (bootstrap t) UCL	0.939
Maximum	9.9	95% KM (BCA) UCL	0.734
Mean	1.279	95% KM (Percentile Bootstrap) UCL	0.714
Median	1.181	95% KM (Chebyshev) UCL	1.156
SD	1.616	97.5% KM (Chebyshev) UCL	1.468
k star	0.213	99% KM (Chebyshev) UCL	2.08
Theta star	6.003		
Nu star	40.92	Potential UCLs to Use	
AppChi2	27.26	95% KM (Chebyshev) UCL	1.156
95% Gamma Approximate UCL	1.92		
95% Adjusted Gamma UCL	1.932		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_IRON

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	48

Raw Statistics

Minimum	53.5
Maximum	212
Mean	97.77
Median	93.8
SD	26.25
Coefficient of Variation	0.269
Skewness	1.934

Log-transformed Statistics

Minimum of Log Data	3.98
Maximum of Log Data	5.357
Mean of log Data	4.553
SD of log Data	0.24

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.151
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0998
Lilliefors Critical Value	0.124

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	103.9

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	104.9
95% Modified-t UCL	104.1

Assuming Lognormal Distribution

95% H-UCL	103.5
95% Chebyshev (MVUE) UCL	112
97.5% Chebyshev (MVUE) UCL	118.3
99% Chebyshev (MVUE) UCL	130.6

Gamma Distribution Test

k star (bias corrected)	15.93
Theta Star	6.139
MLE of Mean	97.77
MLE of Standard Deviation	24.5
nu star	1624
Approximate Chi Square Value (.05)	1532
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	1529
Anderson-Darling Test Statistic	0.691
Anderson-Darling 5% Critical Value	0.749
Kolmogorov-Smirnov Test Statistic	0.117
Kolmogorov-Smirnov 5% Critical Value	0.124

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	103.8
95% Jackknife UCL	103.9
95% Standard Bootstrap UCL	103.7
95% Bootstrap-t UCL	105.4
95% Hall's Bootstrap UCL	106.7
95% Percentile Bootstrap UCL	104.1
95% BCA Bootstrap UCL	104.9
95% Chebyshev(Mean, Sd) UCL	113.8
97.5% Chebyshev(Mean, Sd) UCL	120.7
99% Chebyshev(Mean, Sd) UCL	134.3

Assuming Gamma Distribution

95% Approximate Gamma UCL	103.7
95% Adjusted Gamma UCL	103.9

Potential UCL to Use

Use 95% Approximate Gamma UCL 103.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LEAD

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	37

Raw Statistics

Minimum	0.023
Maximum	0.56
Mean	0.162
Median	0.11
SD	0.122
Coefficient of Variation	0.751
Skewness	1.342

Log-transformed Statistics

Minimum of Log Data	-3.772
Maximum of Log Data	-0.58
Mean of log Data	-2.098
SD of log Data	0.783

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.175
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0651
Lilliefors Critical Value	0.124

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.19

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.193
95% Modified-t UCL	0.191

Assuming Lognormal Distribution

95% H-UCL	0.21
95% Chebyshev (MVUE) UCL	0.254
97.5% Chebyshev (MVUE) UCL	0.292
99% Chebyshev (MVUE) UCL	0.367

Gamma Distribution Test

k star (bias corrected)	1.851
Theta Star	0.0875
MLE of Mean	0.162
MLE of Standard Deviation	0.119
nu star	188.8
Approximate Chi Square Value (.05)	158
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	157.2
Anderson-Darling Test Statistic	0.383
Anderson-Darling 5% Critical Value	0.763
Kolmogorov-Smirnov Test Statistic	0.112
Kolmogorov-Smirnov 5% Critical Value	0.126

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.19
95% Jackknife UCL	0.19
95% Standard Bootstrap UCL	0.19
95% Bootstrap-t UCL	0.195
95% Hall's Bootstrap UCL	0.194
95% Percentile Bootstrap UCL	0.19
95% BCA Bootstrap UCL	0.193
95% Chebyshev(Mean, Sd) UCL	0.236
97.5% Chebyshev(Mean, Sd) UCL	0.268
99% Chebyshev(Mean, Sd) UCL	0.331

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.193
95% Adjusted Gamma UCL	0.194

Potential UCL to Use

Use 95% Approximate Gamma UCL 0.193

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_MANGANESE

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	49

Raw Statistics

Minimum	22.2
Maximum	198
Mean	49.62
Median	41.7
SD	33.54
Coefficient of Variation	0.676
Skewness	2.668

Log-transformed Statistics

Minimum of Log Data	3.1
Maximum of Log Data	5.288
Mean of log Data	3.75
SD of log Data	0.528

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.207
Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.14
Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	57.49

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	59.22
95% Modified-t UCL	57.78

Assuming Lognormal Distribution

95% H-UCL	56.34
95% Chebyshev (MVUE) UCL	65.36
97.5% Chebyshev (MVUE) UCL	72.54
99% Chebyshev (MVUE) UCL	86.65

Gamma Distribution Test

k star (bias corrected)	3.214
Theta Star	15.44
MLE of Mean	49.62
MLE of Standard Deviation	27.68
nu star	327.8
Approximate Chi Square Value (.05)	286.8
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	285.7
Anderson-Darling Test Statistic	1.71
Anderson-Darling 5% Critical Value	0.756
Kolmogorov-Smirnov Test Statistic	0.145
Kolmogorov-Smirnov 5% Critical Value	0.125

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	56.7
95% Adjusted Gamma UCL	56.92

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	57.35
95% Jackknife UCL	57.49
95% Standard Bootstrap UCL	57.27
95% Bootstrap-t UCL	60.69
95% Hall's Bootstrap UCL	67.98
95% Percentile Bootstrap UCL	57.86
95% BCA Bootstrap UCL	59.73
95% Chebyshev(Mean, Sd) UCL	70.09
97.5% Chebyshev(Mean, Sd) UCL	78.95
99% Chebyshev(Mean, Sd) UCL	96.35

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 70.09

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_MERCURY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_MERCURY

General Statistics

Number of Valid Data	51	Number of Detected Data	5
Number of Distinct Detected Data	4	Number of Non-Detect Data	46
		Percent Non-Detects	90.20%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.039	Minimum Detected	-3.244
Maximum Detected	0.063	Maximum Detected	-2.765
Mean of Detected	0.0478	Mean of Detected	-3.064
SD of Detected	0.0117	SD of Detected	0.237
Minimum Non-Detect	0.2	Minimum Non-Detect	-1.609
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.766	Shapiro Wilk Test Statistic	0.762
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0949	Mean	-2.377
SD	0.016	SD	0.238
95% DL/2 (t) UCL	0.0986	95% H-Stat (DL/2) UCL	0.121
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.064
		SD in Log Scale	0.261
		Mean in Original Scale	0.0483
		SD in Original Scale	0.0127
		95% Percentile Bootstrap UCL	0.0513
		95% BCA Bootstrap UCL	0.0515

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	8.854	Data appear Normal at 5% Significance Level
Theta Star	0.0054	
nu star	88.54	
A-D Test Statistic	0.734	
5% A-D Critical Value	0.679	
K-S Test Statistic	0.679	
5% K-S Critical Value	0.357	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.0122	Mean	0.0478
Maximum	0.063	SD	0.0105
Mean	0.0466	SE of Mean	0.00525
Median	0.0491	95% KM (t) UCL	0.0566
SD	0.0121	95% KM (z) UCL	0.0564
k star	10.72	95% KM (jackknife) UCL	0.0575
Theta star	0.00435	95% KM (bootstrap t) UCL	0.223
Nu star	1093	95% KM (BCA) UCL	0.057
AppChi2	1018	95% KM (Percentile Bootstrap) UCL	0.0573
95% Gamma Approximate UCL	0.0501	95% KM (Chebyshev) UCL	0.0707
95% Adjusted Gamma UCL	0.0502	97.5% KM (Chebyshev) UCL	0.0806
		99% KM (Chebyshev) UCL	0.1
		Potential UCLs to Use	
		95% KM (t) UCL	0.0566
		95% KM (Percentile Bootstrap) UCL	0.0573

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NAPHTHALENE

General Statistics

Number of Valid Data	96	Number of Detected Data	92
Number of Distinct Detected Data	68	Number of Non-Detect Data	4
		Percent Non-Detects	4.17%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.038	Minimum Detected	-3.27
Maximum Detected	6.7	Maximum Detected	1.902
Mean of Detected	0.768	Mean of Detected	-1.017
SD of Detected	1.21	SD of Detected	1.158
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.281	Lilliefors Test Statistic	0.101
5% Lilliefors Critical Value	0.0924	5% Lilliefors Critical Value	0.0924
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.74	Mean	-1.073
SD	1.192	SD	1.165
95% DL/2 (t) UCL	0.942	95% H-Stat (DL/2) UCL	0.943
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.337	Mean in Log Scale	-1.068
SD	1.584	SD in Log Scale	1.162
95% MLE (t) UCL	0.605	Mean in Original Scale	0.74
95% MLE (Tiku) UCL	0.627	SD in Original Scale	1.191
		95% Percentile Bootstrap UCL	0.949
		95% BCA Bootstrap UCL	0.991

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.771	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.995	
nu star	141.9	
A-D Test Statistic	4.476	**Nonparametric Statistics**
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method
K-S Test Statistic	0.792	Mean 0.741
5% K-S Critical Value	0.0968	SD 1.185
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.122
		95% KM (t) UCL 0.942
Assuming Gamma Distribution		95% KM (z) UCL 0.941
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.942
Minimum	1E-09	95% KM (bootstrap t) UCL 1.003
Maximum	6.7	95% KM (BCA) UCL 0.96
Mean	0.736	95% KM (Percentile Bootstrap) UCL 0.946
Median	0.26	95% KM (Chebyshev) UCL 1.271
SD	1.193	97.5% KM (Chebyshev) UCL 1.5
k star	0.469	99% KM (Chebyshev) UCL 1.95
Theta star	1.571	
Nu star	90.01	Potential UCLs to Use
AppChi2	69.14	95% KM (Chebyshev) UCL 1.271
95% Gamma Approximate UCL	0.959	
95% Adjusted Gamma UCL	0.963	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NICKEL

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	25

Raw Statistics

Minimum	4.8
Maximum	7.9
Mean	6.181
Median	6.2
SD	0.774
Coefficient of Variation	0.125
Skewness	0.212

Log-transformed Statistics

Minimum of Log Data	1.569
Maximum of Log Data	2.067
Mean of log Data	1.814
SD of log Data	0.125

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.107
Lilliefors Critical Value	0.124

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0998
Lilliefors Critical Value	0.124

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.363

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6.363
95% Modified-t UCL	6.364

Assuming Lognormal Distribution

95% H-UCL	6.371
95% Chebyshev (MVUE) UCL	6.656
97.5% Chebyshev (MVUE) UCL	6.861
99% Chebyshev (MVUE) UCL	7.264

Gamma Distribution Test

k star (bias corrected)	61.45
Theta Star	0.101
MLE of Mean	6.181
MLE of Standard Deviation	0.789
nu star	6267
Approximate Chi Square Value (.05)	6084
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	6079
Anderson-Darling Test Statistic	0.427
Anderson-Darling 5% Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.105
Kolmogorov-Smirnov 5% Critical Value	0.124

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.367
95% Adjusted Gamma UCL	6.373

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	6.36
95% Jackknife UCL	6.363
95% Standard Bootstrap UCL	6.356
95% Bootstrap-t UCL	6.364
95% Hall's Bootstrap UCL	6.365
95% Percentile Bootstrap UCL	6.361
95% BCA Bootstrap UCL	6.357
95% Chebyshev(Mean, Sd) UCL	6.654
97.5% Chebyshev(Mean, Sd) UCL	6.858
99% Chebyshev(Mean, Sd) UCL	7.26

Potential UCL to Use

Use 95% Student's-t UCL 6.363

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_PHENANTHRENE

General Statistics

Number of Valid Data	96	Number of Detected Data	84
Number of Distinct Detected Data	53	Number of Non-Detect Data	12
		Percent Non-Detects	12.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.042	Minimum Detected	-3.17
Maximum Detected	1.2	Maximum Detected	0.182
Mean of Detected	0.122	Mean of Detected	-2.31
SD of Detected	0.134	SD of Detected	0.563
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.274	Lilliefors Test Statistic	0.129
5% Lilliefors Critical Value	0.0967	5% Lilliefors Critical Value	0.0967
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.119	Mean	-2.316
SD	0.125	SD	0.527
95% DL/2 (t) UCL	0.14	95% H-Stat (DL/2) UCL	0.148
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.326
		SD in Log Scale	0.545
		Mean in Original Scale	0.119
		SD in Original Scale	0.126
		95% Percentile Bootstrap UCL	0.142
		95% BCA Bootstrap UCL	0.156

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.45	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.05	
nu star	411.6	
A-D Test Statistic	3.124	**Nonparametric Statistics**
5% A-D Critical Value	0.761	Kaplan-Meier (KM) Method
K-S Test Statistic	0.761	Mean 0.119
5% K-S Critical Value	0.0985	SD 0.125
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.0129
		95% KM (t) UCL 0.14
Assuming Gamma Distribution		95% KM (z) UCL 0.14
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.14
Minimum	0.042	95% KM (bootstrap t) UCL 0.16
Maximum	1.2	95% KM (BCA) UCL 0.143
Mean	0.123	95% KM (Percentile Bootstrap) UCL 0.142
Median	0.0925	95% KM (Chebyshev) UCL 0.175
SD	0.126	97.5% KM (Chebyshev) UCL 0.2
k star	2.67	99% KM (Chebyshev) UCL 0.248
Theta star	0.046	
Nu star	512.6	Potential UCLs to Use
AppChi2	461	95% KM (BCA) UCL 0.143
95% Gamma Approximate UCL	0.136	
95% Adjusted Gamma UCL	0.137	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Z:\Projects\Sparrows Point GAP\proucl_pahs\inp_CPOA-SW_N_PYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_PYRENE

General Statistics

Number of Valid Data	96	Number of Detected Data	29
Number of Distinct Detected Data	25	Number of Non-Detect Data	67
		Percent Non-Detects	69.79%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.011	Minimum Detected	-4.51
Maximum Detected	4.7	Maximum Detected	1.548
Mean of Detected	0.446	Mean of Detected	-2.818
SD of Detected	1.138	SD of Detected	1.761
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.435	Shapiro Wilk Test Statistic	0.816
5% Shapiro Wilk Critical Value	0.926	5% Shapiro Wilk Critical Value	0.926
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.201	Mean	-2.494
SD	0.639	SD	0.98
95% DL/2 (t) UCL	0.309	95% H-Stat (DL/2) UCL	0.255
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.253
		SD in Log Scale	1.437
		Mean in Original Scale	0.177
		SD in Original Scale	0.646
		95% Percentile Bootstrap UCL	0.293
		95% BCA Bootstrap UCL	0.34

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.325	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.371		
nu star	18.84		
A-D Test Statistic	4.088	Nonparametric Statistics	
5% A-D Critical Value	0.848	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.848	Mean	0.163
5% K-S Critical Value	0.176	SD	0.643
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0672
		95% KM (t) UCL	0.274
Assuming Gamma Distribution		95% KM (z) UCL	0.273
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.273
Minimum	1E-09	95% KM (bootstrap t) UCL	0.39
Maximum	4.7	95% KM (BCA) UCL	0.293
Mean	0.423	95% KM (Percentile Bootstrap) UCL	0.279
Median	0.357	95% KM (Chebyshev) UCL	0.455
SD	0.65	97.5% KM (Chebyshev) UCL	0.582
k star	0.275	99% KM (Chebyshev) UCL	0.831
Theta star	1.537		
Nu star	52.83	Potential UCLs to Use	
AppChi2	37.13	95% KM (Chebyshev) UCL	0.455
95% Gamma Approximate UCL	0.602		
95% Adjusted Gamma UCL	0.605		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_SELENIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_SELENIUM

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	44

Raw Statistics

Minimum	6.4
Maximum	24.5
Mean	12.51
Median	12
SD	4.094
Coefficient of Variation	0.327
Skewness	0.907

Log-transformed Statistics

Minimum of Log Data	1.856
Maximum of Log Data	3.199
Mean of log Data	2.477
SD of log Data	0.317

Relevant UCL Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.104
Lilliefors Critical Value	0.124

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0661
Lilliefors Critical Value	0.124

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	13.47

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	13.53
95% Modified-t UCL	13.48

Assuming Lognormal Distribution

95% H-UCL	13.52
95% Chebyshev (MVUE) UCL	14.98
97.5% Chebyshev (MVUE) UCL	16.04
99% Chebyshev (MVUE) UCL	18.14

Gamma Distribution Test

k star (bias corrected)	9.613
Theta Star	1.301
MLE of Mean	12.51
MLE of Standard Deviation	4.035
nu star	980.6
Approximate Chi Square Value (.05)	908.9
Adjusted Level of Significance	0.0453
Adjusted Chi Square Value	906.9
Anderson-Darling Test Statistic	0.354
Anderson-Darling 5% Critical Value	0.75
Kolmogorov-Smirnov Test Statistic	0.081
Kolmogorov-Smirnov 5% Critical Value	0.124

Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	13.45
95% Jackknife UCL	13.47
95% Standard Bootstrap UCL	13.45
95% Bootstrap-t UCL	13.55
95% Hall's Bootstrap UCL	13.55
95% Percentile Bootstrap UCL	13.47
95% BCA Bootstrap UCL	13.53
95% Chebyshev(Mean, Sd) UCL	15.01
97.5% Chebyshev(Mean, Sd) UCL	16.09
99% Chebyshev(Mean, Sd) UCL	18.22

Assuming Gamma Distribution

95% Approximate Gamma UCL	13.5
95% Adjusted Gamma UCL	13.53

Potential UCL to Use

Use 95% Student's-t UCL 13.47

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_THALLIUM

General Statistics

Number of Valid Data	51	Number of Detected Data	37
Number of Distinct Detected Data	30	Number of Non-Detect Data	14
		Percent Non-Detects	27.45%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.016	Minimum Detected	-4.135
Maximum Detected	0.13	Maximum Detected	-2.04
Mean of Detected	0.0475	Mean of Detected	-3.243
SD of Detected	0.0315	SD of Detected	0.625
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.85	Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.936	5% Shapiro Wilk Critical Value	0.936
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.172	Mean	-2.543
SD	0.206	SD	1.266
95% DL/2 (t) UCL	0.22	95% H-Stat (DL/2) UCL	0.829
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.243
		SD in Log Scale	0.605
		Mean in Original Scale	0.0469
		SD in Original Scale	0.0298
		95% Percentile Bootstrap UCL	0.0536
		95% BCA Bootstrap UCL	0.0543

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.52	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	0.0188	
nu star	186.5	
A-D Test Statistic	0.819	
5% A-D Critical Value	0.756	
K-S Test Statistic	0.756	
5% K-S Critical Value	0.146	
Data follow Appr. Gamma Distribution at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.0475
Maximum	0.13	SD	0.031
Mean	0.0477	SE of Mean	0.00517
Median	0.04	95% KM (t) UCL	0.0561
SD	0.0296	95% KM (z) UCL	0.056
k star	1.086	95% KM (jackknife) UCL	0.0562
Theta star	0.0439	95% KM (bootstrap t) UCL	0.0575
Nu star	110.7	95% KM (BCA) UCL	0.0559
AppChi2	87.45	95% KM (Percentile Bootstrap) UCL	0.0562
95% Gamma Approximate UCL	0.0603	95% KM (Chebyshev) UCL	0.07
95% Adjusted Gamma UCL	0.0608	97.5% KM (Chebyshev) UCL	0.0798
		99% KM (Chebyshev) UCL	0.0989
		Potential UCLs to Use	
		95% KM (Percentile Bootstrap) UCL	0.0562

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_TIN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_TIN

General Statistics

Number of Valid Data	51	Number of Detected Data	11
Number of Distinct Detected Data	10	Number of Non-Detect Data	40
		Percent Non-Detects	78.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.5	Minimum Detected	0.405
Maximum Detected	3.2	Maximum Detected	1.163
Mean of Detected	2.164	Mean of Detected	0.741
SD of Detected	0.575	SD of Detected	0.255
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Test Statistic	0.93
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.427	Mean	0.879
SD	0.293	SD	0.135
95% DL/2 (t) UCL	2.496	95% H-Stat (DL/2) UCL	3.199
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.741
		SD in Log Scale	0.269
		Mean in Original Scale	2.175
		SD in Original Scale	0.594
		95% Percentile Bootstrap UCL	2.31
		95% BCA Bootstrap UCL	2.325

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	12.13	Data appear Normal at 5% Significance Level
Theta Star	0.178	
nu star	266.9	
A-D Test Statistic	0.439	**Nonparametric Statistics**
5% A-D Critical Value	0.729	Kaplan-Meier (KM) Method
K-S Test Statistic	0.729	Mean 2.164
5% K-S Critical Value	0.255	SD 0.548
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.173
		95% KM (t) UCL 2.454
Assuming Gamma Distribution		95% KM (z) UCL 2.449
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 2.465
Minimum	0.572	95% KM (bootstrap t) UCL 2.564
Maximum	3.2	95% KM (BCA) UCL 2.454
Mean	2.14	95% KM (Percentile Bootstrap) UCL 2.454
Median	2.217	95% KM (Chebyshev) UCL 2.919
SD	0.561	97.5% KM (Chebyshev) UCL 3.246
k star	10.93	99% KM (Chebyshev) UCL 3.888
Theta star	0.196	
Nu star	1115	Potential UCLs to Use
AppChi2	1038	95% KM (t) UCL 2.454
95% Gamma Approximate UCL	2.298	95% KM (Percentile Bootstrap) UCL 2.454
95% Adjusted Gamma UCL	2.303	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_TOLUENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_TOLUENE

General Statistics

Number of Valid Data	84	Number of Detected Data	59
Number of Distinct Detected Data	29	Number of Non-Detect Data	25
		Percent Non-Detects	29.76%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.85	Minimum Detected	-0.163
Maximum Detected	15	Maximum Detected	2.708
Mean of Detected	2.551	Mean of Detected	0.682
SD of Detected	2.446	SD of Detected	0.647
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.243	Lilliefors Test Statistic	0.174
5% Lilliefors Critical Value	0.115	5% Lilliefors Critical Value	0.115
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.536	Mean	0.752
SD	2.045	SD	0.551
95% DL/2 (t) UCL	2.907	95% H-Stat (DL/2) UCL	4.225
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.641
		SD in Log Scale	0.604
		Mean in Original Scale	2.363
		SD in Original Scale	2.12
		95% Percentile Bootstrap UCL	2.77
		95% BCA Bootstrap UCL	2.877

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.019	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.263		
nu star	238.3		
A-D Test Statistic	3.357	**Nonparametric Statistics**	
5% A-D Critical Value	0.762	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.762	Mean	2.34
5% K-S Critical Value	0.117	SD	2.117
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.242
		95% KM (t) UCL	2.743
Assuming Gamma Distribution		95% KM (z) UCL	2.738
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.742
Minimum	0.85	95% KM (bootstrap t) UCL	2.904
Maximum	15	95% KM (BCA) UCL	2.788
Mean	2.552	95% KM (Percentile Bootstrap) UCL	2.763
Median	2.521	95% KM (Chebyshev) UCL	3.395
SD	2.045	97.5% KM (Chebyshev) UCL	3.852
k star	2.855	99% KM (Chebyshev) UCL	4.749
Theta star	0.894		
Nu star	479.6	Potential UCLs to Use	
AppChi2	429.9	95% KM (BCA) UCL	2.788
95% Gamma Approximate UCL	2.847		
95% Adjusted Gamma UCL	2.852		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_VANADIUM

General Statistics

Number of Valid Data	51	Number of Detected Data	48
Number of Distinct Detected Data	34	Number of Non-Detect Data	3
		Percent Non-Detects	5.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.1	Minimum Detected	-2.303
Maximum Detected	2.8	Maximum Detected	1.03
Mean of Detected	0.959	Mean of Detected	-0.221
SD of Detected	0.57	SD of Detected	0.635
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk Test Statistic	0.97
5% Shapiro Wilk Critical Value	0.947	5% Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.932	Mean	-0.249
SD	0.563	SD	0.626
95% DL/2 (t) UCL	1.064	95% H-Stat (DL/2) UCL	1.247
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.637	Mean in Log Scale	-0.24
SD	0.868	SD in Log Scale	0.624
95% MLE (t) UCL	0.84	Mean in Original Scale	0.938
95% MLE (Tiku) UCL	0.962	SD in Original Scale	0.56
		95% Percentile Bootstrap UCL	1.07
		95% BCA Bootstrap UCL	1.076

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	2.776	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.345	
nu star	266.5	
A-D Test Statistic	0.393	
5% A-D Critical Value	0.757	
K-S Test Statistic	0.757	
5% K-S Critical Value	0.129	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.1	Mean	0.939
Maximum	2.8	SD	0.556
Mean	0.949	SE of Mean	0.0791
Median	0.77	95% KM (t) UCL	1.071
SD	0.558	95% KM (z) UCL	1.069
k star	2.869	95% KM (jackknife) UCL	1.071
Theta star	0.331	95% KM (bootstrap t) UCL	1.087
Nu star	292.7	95% KM (BCA) UCL	1.075
AppChi2	254	95% KM (Percentile Bootstrap) UCL	1.071
95% Gamma Approximate UCL	1.093	95% KM (Chebyshev) UCL	1.283
95% Adjusted Gamma UCL	1.097	97.5% KM (Chebyshev) UCL	1.432
		99% KM (Chebyshev) UCL	1.725
		Potential UCLs to Use	
		95% KM (BCA) UCL	1.075

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_XYLENES TOTAL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_XYLENES (TOTAL)

General Statistics

Number of Valid Data	42	Number of Detected Data	14
Number of Distinct Detected Data	14	Number of Non-Detect Data	28
		Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.8	Minimum Detected	1.03
Maximum Detected	6.5	Maximum Detected	1.872
Mean of Detected	3.957	Mean of Detected	1.346
SD of Detected	1.07	SD of Detected	0.244
Minimum Non-Detect	15	Minimum Non-Detect	2.708
Maximum Non-Detect	15	Maximum Non-Detect	2.708

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.84	Shapiro Wilk Test Statistic	0.903
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	6.319	Mean	1.792
SD	1.794	SD	0.347
95% DL/2 (t) UCL	6.785	95% H-Stat (DL/2) UCL	11.92
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	1.346
		SD in Log Scale	0.241
		Mean in Original Scale	3.955
		SD in Original Scale	0.992
		95% Percentile Bootstrap UCL	4.21
		95% BCA Bootstrap UCL	4.227

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	13.51	Data appear Lognormal at 5% Significance Level	
Theta Star	0.293		
nu star	378.3		
A-D Test Statistic	0.741	**Nonparametric Statistics**	
5% A-D Critical Value	0.734	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.734	Mean	3.957
5% K-S Critical Value	0.228	SD	1.031
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.286
		95% KM (t) UCL	4.438
Assuming Gamma Distribution		95% KM (z) UCL	4.427
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.45
Minimum	1.609	95% KM (bootstrap t) UCL	4.783
Maximum	6.5	95% KM (BCA) UCL	4.45
Mean	3.939	95% KM (Percentile Bootstrap) UCL	4.44
Median	3.911	95% KM (Chebyshev) UCL	5.203
SD	0.95	97.5% KM (Chebyshev) UCL	5.742
k star	14.99	99% KM (Chebyshev) UCL	6.802
Theta star	0.263		
Nu star	1259	Potential UCLs to Use	
AppChi2	1178	95% KM (t) UCL	4.438
95% Gamma Approximate UCL	4.211	95% KM (% Bootstrap) UCL	4.44
95% Adjusted Gamma UCL	4.221		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_CPOA-SW_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ZINC

General Statistics

Number of Valid Observations	51	Number of Distinct Observations	39

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.7	Minimum of Log Data	1.308
Maximum	84.6	Maximum of Log Data	4.438
Mean	8.879	Mean of log Data	1.926
Median	6.4	SD of log Data	0.543
SD	12.37		
Coefficient of Variation	1.393		
Skewness	5.366		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.372	Lilliefors Test Statistic	0.202
Lilliefors Critical Value	0.124	Lilliefors Critical Value	0.124
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11.78	95% H-UCL	9.204
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.71
95% Adjusted-CLT UCL	13.12	97.5% Chebyshev (MVUE) UCL	11.91
95% Modified-t UCL	12	99% Chebyshev (MVUE) UCL	14.27

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	1.983	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.479	
MLE of Mean	8.879	
MLE of Standard Deviation	6.306	
nu star	202.2	
Approximate Chi Square Value (.05)	170.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0453	95% CLT UCL 11.73
Adjusted Chi Square Value	169.5	95% Jackknife UCL 11.78
		95% Standard Bootstrap UCL 11.72
Anderson-Darling Test Statistic	6.438	95% Bootstrap-t UCL 23.94
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL 26.45
Kolmogorov-Smirnov Test Statistic	0.289	95% Percentile Bootstrap UCL 12.06
Kolmogorov-Smirnov 5% Critical Value	0.126	95% BCA Bootstrap UCL 13.7
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 16.43
		97.5% Chebyshev(Mean, Sd) UCL 19.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 26.11
95% Approximate Gamma UCL	10.54	
95% Adjusted Gamma UCL	10.6	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 16.43

PATAPSCO RIVER BACKGROUND AREA PROUCL OUTPUT

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_1234678-HPCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.000011	Minimum of Log Data	-11.42
Maximum	0.00043	Maximum of Log Data	-7.752
Mean	9.883E-05	Mean of log Data	-10.14
Median	0.000022	SD of log Data	1.365
SD	0.0001648		
Coefficient of Variation	N/A		
Skewness	2.292		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.619	Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.0002344	95% H-UCL	0.0027
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0002647
95% Adjusted-CLT UCL	0.0002768	97.5% Chebyshev (MVUE) UCL	0.0003447
95% Modified-t UCL	0.0002449	99% Chebyshev (MVUE) UCL	0.0005019

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.442	Data appear Lognormal at 5% Significance Level
Theta Star	0.0002238	
MLE of Mean	9.883E-05	
MLE of Standard Deviation	0.0001487	
nu star	5.3	
Approximate Chi Square Value (.05)	1.293	
Adjusted Level of Significance	0.0122	
Adjusted Chi Square Value	0.713	
Anderson-Darling Test Statistic	0.761	
Anderson-Darling 5% Critical Value	0.726	
Kolmogorov-Smirnov Test Statistic	0.364	
Kolmogorov-Smirnov 5% Critical Value	0.345	
Data not Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	0.0002095
95% Jackknife UCL	0.0002344
95% Standard Bootstrap UCL	0.0001998
95% Bootstrap-t UCL	0.00285
95% Hall's Bootstrap UCL	0.00193
95% Percentile Bootstrap UCL	0.000224
95% BCA Bootstrap UCL	0.000248
95% Chebyshev(Mean, Sd) UCL	0.0003921
97.5% Chebyshev(Mean, Sd) UCL	0.000519
99% Chebyshev(Mean, Sd) UCL	0.0007683

Assuming Gamma Distribution	
95% Approximate Gamma UCL	0.000405
95% Adjusted Gamma UCL	0.0007352

Potential UCL to Use	Use 95% Chebyshev (MVUE) UCL 0.0002647

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_1234678-HPCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDF

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0000037	Minimum Detected	-12.51
Maximum Detected	0.000095	Maximum Detected	-9.262
Mean of Detected	2.895E-05	Mean of Detected	-11.36
SD of Detected	4.424E-05	SD of Detected	1.508
Minimum Non-Detect	0.0000022	Minimum Non-Detect	-13.03
Maximum Non-Detect	0.0000024	Maximum Non-Detect	-12.94

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	33.33%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.703	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.968E-05	Mean	-12.13
SD	3.716E-05	SD	1.674
95% DL/2 (t) UCL	5.025E-05	95% H-Stat (DL/2) UCL	0.00286
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	8.972E-06	Mean in Log Scale	-12.71
SD	4.47E-05	SD in Log Scale	2.407
95% MLE (t) UCL	4.575E-05	Mean in Original Scale	1.937E-05
95% MLE (Tiku) UCL	4.817E-05	SD in Original Scale	3.735E-05
		95% Percentile Bootstrap UCL	4.883E-05
		95% BCA Bootstrap UCL	5.103E-05

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.334	Data appear Gamma Distributed at 5% Significance Level
Theta Star	8.657E-05	
nu star	2.675	
A-D Test Statistic	0.525	
5% A-D Critical Value	0.674	
K-S Test Statistic	0.674	
5% K-S Critical Value	0.407	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	2.053E-05
Maximum	0.000095	SD	3.347E-05
Mean	0.0000193	SE of Mean	1.578E-05
Median	0.0000039	95% KM (t) UCL	5.233E-05
SD	3.739E-05	95% KM (z) UCL	4.649E-05
k star	0.212	95% KM (jackknife) UCL	5.063E-05
Theta star	9.084E-05	95% KM (bootstrap t) UCL	0.0001766
Nu star	2.55	95% KM (BCA) UCL	5.103E-05
AppChi2	0.253	95% KM (Percentile Bootstrap) UCL	4.955E-05
95% Gamma Approximate UCL	0.0001949	95% KM (Chebyshev) UCL	8.931E-05
95% Adjusted Gamma UCL	N/A	97.5% KM (Chebyshev) UCL	0.0001191
		99% KM (Chebyshev) UCL	0.0001775
		Potential UCLs to Use	
		95% KM (BCA) UCL	5.103E-05

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_2-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0024	Minimum Detected	-6.032
Maximum Detected	0.63	Maximum Detected	-0.462
Mean of Detected	0.14	Mean of Detected	-3.86
SD of Detected	0.275	SD of Detected	2.229
Minimum Non-Detect	0.0067	Minimum Non-Detect	-5.006
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.606	Shapiro Wilk Test Statistic	0.932
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.117	Mean	-4.166
SD	0.252	SD	2.13
95% DL/2 (t) UCL	0.324	95% H-Stat (DL/2) UCL	675.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.2
		SD in Log Scale	2.161
		Mean in Original Scale	0.117
		SD in Original Scale	0.252
		95% Percentile Bootstrap UCL	0.317
		95% BCA Bootstrap UCL	0.331

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.275	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.507	
nu star	2.752	
A-D Test Statistic	0.513	
5% A-D Critical Value	0.731	
K-S Test Statistic	0.731	
5% K-S Critical Value	0.378	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	1E-09
Maximum	0.63
Mean	0.116
Median	0.00945
SD	0.252
k star	0.195
Theta star	0.598
Nu star	2.337
AppChi2	0.207
95% Gamma Approximate UCL	1.316
95% Adjusted Gamma UCL	2.687

Note: DL/2 is not a recommended method.

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.117
SD	0.23
SE of Mean	0.105
95% KM (t) UCL	0.328
95% KM (z) UCL	0.29
95% KM (jackknife) UCL	0.324
95% KM (bootstrap t) UCL	4.694
95% KM (BCA) UCL	0.323
95% KM (Percentile Bootstrap) UCL	0.318
95% KM (Chebyshev) UCL	0.574
97.5% KM (Chebyshev) UCL	0.772
99% KM (Chebyshev) UCL	1.161
Potential UCLs to Use	
95% KM (Chebyshev) UCL	0.574

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_2378-TCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,7,8-TCDF

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	7.1E-07	Minimum Detected	-14.16
Maximum Detected	0.000014	Maximum Detected	-11.18
Mean of Detected	4.488E-06	Mean of Detected	-13.05
SD of Detected	6.38E-06	SD of Detected	1.345
Minimum Non-Detect	4.5E-07	Minimum Non-Detect	-14.61
Maximum Non-Detect	0.0000006	Maximum Non-Detect	-14.33

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	33.33%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.891
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.079E-06	Mean	-13.75
SD	5.402E-06	SD	1.512
95% DL/2 (t) UCL	7.523E-06	95% H-Stat (DL/2) UCL	0.0001832
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.586E-06	Mean in Log Scale	-14.27
SD	6.466E-06	SD in Log Scale	2.164
95% MLE (t) UCL	6.905E-06	Mean in Original Scale	3.01E-06
95% MLE (Tiku) UCL	7.257E-06	SD in Original Scale	5.447E-06
		95% Percentile Bootstrap UCL	7.175E-06
		95% BCA Bootstrap UCL	7.776E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.368	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.218E-05	
nu star	2.948	
A-D Test Statistic	0.489	
5% A-D Critical Value	0.669	
K-S Test Statistic	0.669	
5% K-S Critical Value	0.404	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	3.228E-06
Maximum	0.000014	SD	4.85E-06
Mean	2.992E-06	SE of Mean	2.287E-06
Median	8.25E-07	95% KM (t) UCL	7.836E-06
SD	5.458E-06	95% KM (z) UCL	6.989E-06
k star	0.234	95% KM (jackknife) UCL	7.561E-06
Theta star	1.277E-05	95% KM (bootstrap t) UCL	2.308E-05
Nu star	2.813	95% KM (BCA) UCL	7.62E-06
AppChi2	0.319	95% KM (Percentile Bootstrap) UCL	7.47E-06
95% Gamma Approximate UCL	2.637E-05	95% KM (Chebyshev) UCL	1.32E-05
95% Adjusted Gamma UCL	N/A	97.5% KM (Chebyshev) UCL	1.751E-05
		99% KM (Chebyshev) UCL	2.598E-05
		Potential UCLs to Use	
		95% KM (BCA) UCL	7.62E-06

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_ANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ANTHRACENE

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0018	Minimum Detected	-6.32
Maximum Detected	0.65	Maximum Detected	-0.431
Mean of Detected	0.143	Mean of Detected	-3.966
SD of Detected	0.284	SD of Detected	2.352
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0064	Maximum Non-Detect	-5.051

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.599	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.119	Mean	-4.262
SD	0.26	SD	2.225
95% DL/2 (t) UCL	0.334	95% H-Stat (DL/2) UCL	1754
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.329
		SD in Log Scale	2.284
		Mean in Original Scale	0.119
		SD in Original Scale	0.26
		95% Percentile Bootstrap UCL	0.329
		95% BCA Bootstrap UCL	0.341

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.268	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.533	
nu star	2.675	
A-D Test Statistic	0.5	
5% A-D Critical Value	0.734	
K-S Test Statistic	0.734	
5% K-S Critical Value	0.378	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1E-09	Mean	0.119
Maximum	0.65	SD	0.238
Mean	0.119	SE of Mean	0.109
Median	0.0105	95% KM (t) UCL	0.338
SD	0.261	95% KM (z) UCL	0.298
k star	0.193	95% KM (jackknife) UCL	0.333
Theta star	0.615	95% KM (bootstrap t) UCL	3.728
Nu star	2.317	95% KM (BCA) UCL	0.329
AppChi2	0.203	95% KM (Percentile Bootstrap) UCL	0.329
95% Gamma Approximate UCL	1.358	95% KM (Chebyshev) UCL	0.592
95% Adjusted Gamma UCL	2.752	97.5% KM (Chebyshev) UCL	0.797
		99% KM (Chebyshev) UCL	1.199
		Potential UCLs to Use	
		95% KM (Chebyshev) UCL	0.592

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ARSENIC

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.2	Minimum of Log Data	0.788
Maximum	16.2	Maximum of Log Data	2.785
Mean	6.217	Mean of log Data	1.551
Median	3.75	SD of log Data	0.781
SD	5.466		
Coefficient of Variation	0.879		
Skewness	1.589		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.792	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10.71	95% H-UCL	21.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.35
95% Adjusted-CLT UCL	11.43	97.5% Chebyshev (MVUE) UCL	17.95
95% Modified-t UCL	10.95	99% Chebyshev (MVUE) UCL	25.02

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	1.091	Data appear Normal at 5% Significance Level
Theta Star	5.7	
MLE of Mean	6.217	
MLE of Standard Deviation	5.953	
nu star	13.09	
Approximate Chi Square Value (.05)	5.952	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 9.887
Adjusted Chi Square Value	4.335	95% Jackknife UCL 10.71
		95% Standard Bootstrap UCL 9.546
Anderson-Darling Test Statistic	0.457	95% Bootstrap-t UCL 26.93
Anderson-Darling 5% Critical Value	0.705	95% Hall's Bootstrap UCL 30.46
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL 9.767
Kolmogorov-Smirnov 5% Critical Value	0.336	95% BCA Bootstrap UCL 10.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 15.94
		97.5% Chebyshev(Mean, Sd) UCL 20.15
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.42
95% Approximate Gamma UCL	13.67	
95% Adjusted Gamma UCL	18.77	

Potential UCL to Use		Use 95% Student's-t UCL	10.71

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_BENZOAANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)ANTHRACENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	1.2	Maximum of Log Data	0.182
Mean	0.222	Mean of log Data	-3.561
Median	0.026	SD of log Data	2.208
SD	0.48		
Coefficient of Variation	2.159		
Skewness	2.432		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.545	Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.617	95% H-UCL	1387
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.639
95% Adjusted-CLT UCL	0.752	97.5% Chebyshev (MVUE) UCL	0.852
95% Modified-t UCL	0.649	99% Chebyshev (MVUE) UCL	1.269

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.276	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.805	
MLE of Mean	0.222	
MLE of Standard Deviation	0.423	
nu star	3.313	
Approximate Chi Square Value (.05)	0.471	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.544
Adjusted Chi Square Value	0.215	95% Jackknife UCL 0.617
		95% Standard Bootstrap UCL 0.515
Anderson-Darling Test Statistic	0.67	95% Bootstrap-t UCL 6.735
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL 3.982
Kolmogorov-Smirnov Test Statistic	0.308	95% Percentile Bootstrap UCL 0.608
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 0.626
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.076
		97.5% Chebyshev(Mean, Sd) UCL 1.445
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.171
95% Approximate Gamma UCL	1.564	
95% Adjusted Gamma UCL	3.428	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.428

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_BENZOAPYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	1.1	Maximum of Log Data	0.0953
Mean	0.203	Mean of log Data	-3.572
Median	0.022	SD of log Data	2.112
SD	0.44		
Coefficient of Variation	2.162		
Skewness	2.433		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.543	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.565	95% H-UCL	554.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.549
95% Adjusted-CLT UCL	0.689	97.5% Chebyshev (MVUE) UCL	0.731
95% Modified-t UCL	0.595	99% Chebyshev (MVUE) UCL	1.087

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.282	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.722	
MLE of Mean	0.203	
MLE of Standard Deviation	0.383	
nu star	3.38	
Approximate Chi Square Value (.05)	0.493	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.499
Adjusted Chi Square Value	0.226	95% Jackknife UCL 0.565
		95% Standard Bootstrap UCL 0.472
Anderson-Darling Test Statistic	0.701	95% Bootstrap-t UCL 6.696
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 3.466
Kolmogorov-Smirnov Test Statistic	0.314	95% Percentile Bootstrap UCL 0.557
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.735
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.986
		97.5% Chebyshev(Mean, Sd) UCL 1.325
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.99
95% Approximate Gamma UCL	1.394	
95% Adjusted Gamma UCL	3.039	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.039

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_BENZOBFLUORANTHEN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0056	Minimum of Log Data	-5.185
Maximum	1.9	Maximum of Log Data	0.642
Mean	0.343	Mean of log Data	-3.234
Median	0.0245	SD of log Data	2.159
SD	0.764		
Coefficient of Variation	2.23		
Skewness	2.44		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.531	Shapiro Wilk Test Statistic	0.88
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.971	95% H-UCL	1213
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.826
95% Adjusted-CLT UCL	1.187	97.5% Chebyshev (MVUE) UCL	1.099
95% Modified-t UCL	1.023	99% Chebyshev (MVUE) UCL	1.637

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.269	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	1.272	
MLE of Mean	0.343	
MLE of Standard Deviation	0.66	
nu star	3.23	
Approximate Chi Square Value (.05)	0.444	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.855
Adjusted Chi Square Value	0.201	95% Jackknife UCL 0.971
		95% Standard Bootstrap UCL 0.808
Anderson-Darling Test Statistic	0.809	95% Bootstrap-t UCL 20.47
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL 11.81
Kolmogorov-Smirnov Test Statistic	0.33	95% Percentile Bootstrap UCL 0.956
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 1.269
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.702
		97.5% Chebyshev(Mean, Sd) UCL 2.29
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.445
95% Approximate Gamma UCL	2.493	
95% Adjusted Gamma UCL	5.498	

Potential UCL to Use Use 95% Adjusted Gamma UCL 5.498

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_BENZOGHIPERYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(GHI)PERYLENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	0.0047	Minimum of Log Data	-5.36
Maximum	0.83	Maximum of Log Data	-0.186
Mean	0.154	Mean of log Data	-3.673
Median	0.018	SD of log Data	1.944
SD	0.331		
Coefficient of Variation	2.147		
Skewness	2.435		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.54	Shapiro Wilk Test Statistic	0.871
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.427	95% H-UCL	114
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.389
95% Adjusted-CLT UCL	0.521	97.5% Chebyshev (MVUE) UCL	0.516
95% Modified-t UCL	0.449	99% Chebyshev (MVUE) UCL	0.765

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.296	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	0.522	
MLE of Mean	0.154	
MLE of Standard Deviation	0.284	
nu star	3.55	
Approximate Chi Square Value (.05)	0.552	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.377
Adjusted Chi Square Value	0.257	95% Jackknife UCL 0.427
		95% Standard Bootstrap UCL 0.355
Anderson-Darling Test Statistic	0.793	95% Bootstrap-t UCL 5.621
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL 2.655
Kolmogorov-Smirnov Test Statistic	0.333	95% Percentile Bootstrap UCL 0.421
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 0.434
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.744
		97.5% Chebyshev(Mean, Sd) UCL 0.999
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.501
95% Approximate Gamma UCL	0.992	
95% Adjusted Gamma UCL	2.131	

Potential UCL to Use Use 95% Adjusted Gamma UCL 2.131

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CADMIUM

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.083	Minimum of Log Data	-2.489
Maximum	1.6	Maximum of Log Data	0.47
Mean	0.417	Mean of log Data	-1.491
Median	0.175	SD of log Data	1.119
SD	0.59		
Coefficient of Variation	1.414		
Skewness	2.266		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.651	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.903	95% H-UCL	4.085
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.079
95% Adjusted-CLT UCL	1.051	97.5% Chebyshev (MVUE) UCL	1.387
95% Modified-t UCL	0.94	99% Chebyshev (MVUE) UCL	1.992

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.582	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.717	
MLE of Mean	0.417	
MLE of Standard Deviation	0.547	
nu star	6.985	
Approximate Chi Square Value (.05)	2.162	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.813
Adjusted Chi Square Value	1.326	95% Jackknife UCL 0.903
		95% Standard Bootstrap UCL 0.777
Anderson-Darling Test Statistic	0.599	95% Bootstrap-t UCL 3.301
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 2.865
Kolmogorov-Smirnov Test Statistic	0.246	95% Percentile Bootstrap UCL 0.866
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 0.963
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.467
		97.5% Chebyshev(Mean, Sd) UCL 1.921
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.814
95% Approximate Gamma UCL	1.348	
95% Adjusted Gamma UCL	2.198	

Potential UCL to Use	Use 95% Approximate Gamma UCL 1.348

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHROMIUM

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	22.8	Minimum of Log Data	3.127
Maximum	225	Maximum of Log Data	5.416
Mean	61.72	Mean of log Data	3.699
Median	31.65	SD of log Data	0.858
SD	80.14		
Coefficient of Variation	1.299		
Skewness	2.429		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.554	Shapiro Wilk Test Statistic	0.681
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	127.6	95% H-UCL	237
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	136.3
95% Adjusted-CLT UCL	150.2	97.5% Chebyshev (MVUE) UCL	171.8
95% Modified-t UCL	133.1	99% Chebyshev (MVUE) UCL	241.5

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.772	Data do not follow a Discernable Distribution (0.05)
Theta Star	79.98	
MLE of Mean	61.72	
MLE of Standard Deviation	70.26	
nu star	9.259	
Approximate Chi Square Value (.05)	3.484	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 115.5
Adjusted Chi Square Value	2.333	95% Jackknife UCL 127.6
		95% Standard Bootstrap UCL 110.5
Anderson-Darling Test Statistic	1.22	95% Bootstrap-t UCL 718.9
Anderson-Darling 5% Critical Value	0.71	95% Hall's Bootstrap UCL 653.1
Kolmogorov-Smirnov Test Statistic	0.451	95% Percentile Bootstrap UCL 125.9
Kolmogorov-Smirnov 5% Critical Value	0.339	95% BCA Bootstrap UCL 128.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 204.3
		97.5% Chebyshev(Mean, Sd) UCL 266
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 387.2
95% Approximate Gamma UCL	164	
95% Adjusted Gamma UCL	244.9	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 204.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_CHRYSENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHRYSENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0038	Minimum of Log Data	-5.573
Maximum	1	Maximum of Log Data	0
Mean	0.186	Mean of log Data	-3.639
Median	0.0174	SD of log Data	2.09
SD	0.4		
Coefficient of Variation	2.148		
Skewness	2.427		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.547	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.515	95% H-UCL	425.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.498
95% Adjusted-CLT UCL	0.627	97.5% Chebyshev (MVUE) UCL	0.662
95% Modified-t UCL	0.542	99% Chebyshev (MVUE) UCL	0.984

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.283	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.657	
MLE of Mean	0.186	
MLE of Standard Deviation	0.35	
nu star	3.4	
Approximate Chi Square Value (.05)	0.5	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.454
Adjusted Chi Square Value	0.23	95% Jackknife UCL 0.515
		95% Standard Bootstrap UCL 0.43
Anderson-Darling Test Statistic	0.714	95% Bootstrap-t UCL 8.535
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 3.589
Kolmogorov-Smirnov Test Statistic	0.289	95% Percentile Bootstrap UCL 0.506
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.529
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.897
		97.5% Chebyshev(Mean, Sd) UCL 1.205
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.809
95% Approximate Gamma UCL	1.265	
95% Adjusted Gamma UCL	2.753	

Potential UCL to Use Use 95% Adjusted Gamma UCL 2.753

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_COPPER

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	4.6	Minimum of Log Data	1.526
Maximum	105	Maximum of Log Data	4.654
Mean	26.98	Mean of log Data	2.621
Median	10.85	SD of log Data	1.187
SD	39.01		
Coefficient of Variation	1.446		
Skewness	2.242		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.66	Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	59.08	95% H-UCL	351
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	72.34
95% Adjusted-CLT UCL	68.76	97.5% Chebyshev (MVUE) UCL	93.38
95% Modified-t UCL	61.51	99% Chebyshev (MVUE) UCL	134.7

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.547	Data appear Gamma Distributed at 5% Significance Level
Theta Star	49.37	
MLE of Mean	26.98	
MLE of Standard Deviation	36.5	
nu star	6.559	
Approximate Chi Square Value (.05)	1.932	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 53.18
Adjusted Chi Square Value	1.158	95% Jackknife UCL 59.08
		95% Standard Bootstrap UCL 50.99
Anderson-Darling Test Statistic	0.549	95% Bootstrap-t UCL 231.8
Anderson-Darling 5% Critical Value	0.718	95% Hall's Bootstrap UCL 173.2
Kolmogorov-Smirnov Test Statistic	0.249	95% Percentile Bootstrap UCL 56.32
Kolmogorov-Smirnov 5% Critical Value	0.342	95% BCA Bootstrap UCL 63.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 96.41
		97.5% Chebyshev(Mean, Sd) UCL 126.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 185.5
95% Approximate Gamma UCL	91.61	
95% Adjusted Gamma UCL	152.9	

Potential UCL to Use		Use 95% Approximate Gamma UCL	91.61

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_DIBENZOAHANTHRAC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0026	Minimum Detected	-5.952
Maximum Detected	0.26	Maximum Detected	-1.347
Mean of Detected	0.0877	Mean of Detected	-3.393
SD of Detected	0.117	SD of Detected	1.908
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.949
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0595	Mean	-4.169
SD	0.1	SD	1.905
95% DL/2 (t) UCL	0.142	95% H-Stat (DL/2) UCL	88.59
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.242
		SD in Log Scale	1.979
		Mean in Original Scale	0.0593
		SD in Original Scale	0.1
		95% Percentile Bootstrap UCL	0.131
		95% BCA Bootstrap UCL	0.147

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.326	Data appear Normal at 5% Significance Level	
Theta Star	0.269		
nu star	2.611		
A-D Test Statistic	0.264	**Nonparametric Statistics**	
5% A-D Critical Value	0.675	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.675	Mean	0.0593
5% K-S Critical Value	0.407	SD	0.0917
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0432
		95% KM (t) UCL	0.146
Assuming Gamma Distribution		95% KM (z) UCL	0.13
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.14
Minimum	0.0026	95% KM (bootstrap t) UCL	0.312
Maximum	0.26	95% KM (BCA) UCL	0.153
Mean	0.0685	95% KM (Percentile Bootstrap) UCL	0.145
Median	0.0336	95% KM (Chebyshev) UCL	0.248
SD	0.0951	97.5% KM (Chebyshev) UCL	0.329
k star	0.508	99% KM (Chebyshev) UCL	0.49
Theta star	0.135		
Nu star	6.1	Potential UCLs to Use	
AppChi2	1.691	95% KM (t) UCL	0.146
95% Gamma Approximate UCL	0.247	95% KM (Percentile Bootstrap) UCL	0.145
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORANTHENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0039	Minimum of Log Data	-5.547
Maximum	2.2	Maximum of Log Data	0.788
Mean	0.403	Mean of log Data	-3.212
Median	0.0342	SD of log Data	2.394
SD	0.882		
Coefficient of Variation	2.188		
Skewness	2.43		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.544	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.129	95% H-UCL	12733
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.194
95% Adjusted-CLT UCL	1.377	97.5% Chebyshev (MVUE) UCL	1.595
95% Modified-t UCL	1.188	99% Chebyshev (MVUE) UCL	2.384

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.261	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.546	
MLE of Mean	0.403	
MLE of Standard Deviation	0.789	
nu star	3.13	
Approximate Chi Square Value (.05)	0.412	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.995
Adjusted Chi Square Value	0.186	95% Jackknife UCL 1.129
		95% Standard Bootstrap UCL 0.947
Anderson-Darling Test Statistic	0.65	95% Bootstrap-t UCL 12.87
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL 15.84
Kolmogorov-Smirnov Test Statistic	0.281	95% Percentile Bootstrap UCL 1.111
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL 1.17
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.972
		97.5% Chebyshev(Mean, Sd) UCL 2.651
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.985
95% Approximate Gamma UCL	3.063	
95% Adjusted Gamma UCL	6.792	

Potential UCL to Use Use 95% Adjusted Gamma UCL 6.792

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_FLUORENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORENE

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0021	Minimum Detected	-6.166
Maximum Detected	0.63	Maximum Detected	-0.462
Mean of Detected	0.169	Mean of Detected	-3.646
SD of Detected	0.307	SD of Detected	2.415
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.669	Shapiro Wilk Test Statistic	0.975
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.114	Mean	-4.338
SD	0.253	SD	2.156
95% DL/2 (t) UCL	0.322	95% H-Stat (DL/2) UCL	783.7
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.663
		SD in Log Scale	2.445
		Mean in Original Scale	0.113
		SD in Original Scale	0.253
		95% Percentile Bootstrap UCL	0.316
		95% BCA Bootstrap UCL	0.328

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.256	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.661	
nu star	2.05	
A-D Test Statistic	0.398	
5% A-D Critical Value	0.697	
K-S Test Statistic	0.697	
5% K-S Critical Value	0.416	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.0021	Mean	0.114
Maximum	0.63	SD	0.231
Mean	0.118	SE of Mean	0.109
Median	0.0157	95% KM (t) UCL	0.333
SD	0.251	95% KM (z) UCL	0.293
k star	0.308	95% KM (jackknife) UCL	0.321
Theta star	0.384	95% KM (bootstrap t) UCL	2.58
Nu star	3.691	95% KM (BCA) UCL	0.322
AppChi2	0.604	95% KM (Percentile Bootstrap) UCL	0.32
95% Gamma Approximate UCL	0.722	95% KM (Chebyshev) UCL	0.589
95% Adjusted Gamma UCL	N/A	97.5% KM (Chebyshev) UCL	0.794
		99% KM (Chebyshev) UCL	1.198
		Potential UCLs to Use	
		95% KM (BCA) UCL	0.322

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_HPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHND0

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0314	Minimum of Log Data	-3.461
Maximum	8.56	Maximum of Log Data	2.147
Mean	1.613	Mean of log Data	-1.442
Median	0.207	SD of log Data	2.128
SD	3.411		
Coefficient of Variation	2.115		
Skewness	2.424		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.553	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.419	95% H-UCL	5424
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.734
95% Adjusted-CLT UCL	5.376	97.5% Chebyshev (MVUE) UCL	6.3
95% Modified-t UCL	4.649	99% Chebyshev (MVUE) UCL	9.375

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.286	Data appear Gamma Distributed at 5% Significance Level
Theta Star	5.636	
MLE of Mean	1.613	
MLE of Standard Deviation	3.015	
nu star	3.435	
Approximate Chi Square Value (.05)	0.512	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.904
Adjusted Chi Square Value	0.236	95% Jackknife UCL 4.419
		95% Standard Bootstrap UCL 3.717
Anderson-Darling Test Statistic	0.637	95% Bootstrap-t UCL 39.91
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL 23.63
Kolmogorov-Smirnov Test Statistic	0.291	95% Percentile Bootstrap UCL 4.316
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 4.508
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.683
		97.5% Chebyshev(Mean, Sd) UCL 10.31
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.47
95% Approximate Gamma UCL	10.82	
95% Adjusted Gamma UCL	23.49	

Potential UCL to Use Use 95% Adjusted Gamma UCL 23.49

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_HPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHNDDL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0442	Minimum of Log Data	-3.119
Maximum	8.67	Maximum of Log Data	2.16
Mean	1.636	Mean of log Data	-1.328
Median	0.207	SD of log Data	2.012
SD	3.454		
Coefficient of Variation	2.111		
Skewness	2.426		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.551	Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.477	95% H-UCL	2136
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.478
95% Adjusted-CLT UCL	5.447	97.5% Chebyshev (MVUE) UCL	5.946
95% Modified-t UCL	4.71	99% Chebyshev (MVUE) UCL	8.831

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.294	Data appear Gamma Distributed at 5% Significance Level
Theta Star	5.556	
MLE of Mean	1.636	
MLE of Standard Deviation	3.015	
nu star	3.533	
Approximate Chi Square Value (.05)	0.546	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.955
Adjusted Chi Square Value	0.254	95% Jackknife UCL 4.477
		95% Standard Bootstrap UCL 3.754
Anderson-Darling Test Statistic	0.709	95% Bootstrap-t UCL 41.52
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL 30.83
Kolmogorov-Smirnov Test Statistic	0.303	95% Percentile Bootstrap UCL 4.373
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 5.803
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.782
		97.5% Chebyshev(Mean, Sd) UCL 10.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.66
95% Approximate Gamma UCL	10.58	
95% Adjusted Gamma UCL	22.75	

Potential UCL to Use Use 95% Adjusted Gamma UCL 22.75

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_INDENO123-CDPYR.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_INDENO(1,2,3-CD)PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	0.87	Maximum of Log Data	-0.139
Mean	0.173	Mean of log Data	-3.508
Median	0.035	SD of log Data	2.126
SD	0.343		
Coefficient of Variation	1.983		
Skewness	2.392		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.583	Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.455	95% H-UCL	674
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.598
95% Adjusted-CLT UCL	0.55	97.5% Chebyshev (MVUE) UCL	0.795
95% Modified-t UCL	0.478	99% Chebyshev (MVUE) UCL	1.183

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.3	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.577	
MLE of Mean	0.173	
MLE of Standard Deviation	0.316	
nu star	3.604	
Approximate Chi Square Value (.05)	0.572	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.404
Adjusted Chi Square Value	0.268	95% Jackknife UCL 0.455
		95% Standard Bootstrap UCL 0.384
Anderson-Darling Test Statistic	0.53	95% Bootstrap-t UCL 2.07
Anderson-Darling 5% Critical Value	0.755	95% Hall's Bootstrap UCL 2.049
Kolmogorov-Smirnov Test Statistic	0.254	95% Percentile Bootstrap UCL 0.446
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 0.466
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.784
		97.5% Chebyshev(Mean, Sd) UCL 1.048
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.567
95% Approximate Gamma UCL	1.091	
95% Adjusted Gamma UCL	2.332	

Potential UCL to Use Use 95% Adjusted Gamma UCL 2.332

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_IRON

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	3300	Minimum of Log Data	8.102
Maximum	43800	Maximum of Log Data	10.69
Mean	14533	Mean of log Data	9.124
Median	8545	SD of log Data	1.044
SD	15665		
Coefficient of Variation	1.078		
Skewness	1.685		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.793
Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	27420

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	29752
95% Modified-t UCL	28153

Assuming Lognormal Distribution

95% H-UCL	117012
95% Chebyshev (MVUE) UCL	39729
97.5% Chebyshev (MVUE) UCL	50830
99% Chebyshev (MVUE) UCL	72635

Gamma Distribution Test

k star (bias corrected)	0.724
Theta Star	20078
MLE of Mean	14533
MLE of Standard Deviation	17082
nu star	8.686
Approximate Chi Square Value (.05)	3.138
Adjusted Level of Significance	0.0122
Adjusted Chi Square Value	2.064
Anderson-Darling Test Statistic	0.374
Anderson-Darling 5% Critical Value	0.712
Kolmogorov-Smirnov Test Statistic	0.233
Kolmogorov-Smirnov 5% Critical Value	0.339

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	40223
95% Adjusted Gamma UCL	61172

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	25053
95% Jackknife UCL	27420
95% Standard Bootstrap UCL	24203
95% Bootstrap-t UCL	48379
95% Hall's Bootstrap UCL	69223
95% Percentile Bootstrap UCL	25067
95% BCA Bootstrap UCL	29018
95% Chebyshev(Mean, Sd) UCL	42410
97.5% Chebyshev(Mean, Sd) UCL	54472
99% Chebyshev(Mean, Sd) UCL	78166

Potential UCL to Use — Use 95% Student's-t UCL 27420

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LEAD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	6.8	Minimum of Log Data	1.917
Maximum	121	Maximum of Log Data	4.796
Mean	33.53	Mean of log Data	2.923
Median	13.65	SD of log Data	1.121
SD	44.42		
Coefficient of Variation	1.325		
Skewness	2.106		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.692	Shapiro Wilk Test Statistic	0.876
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	70.07	95% H-UCL	341.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	89.4
95% Adjusted-CLT UCL	80.02	97.5% Chebyshev (MVUE) UCL	115
95% Modified-t UCL	72.67	99% Chebyshev (MVUE) UCL	165.2

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.601	Data appear Gamma Distributed at 5% Significance Level
Theta Star	55.76	
MLE of Mean	33.53	
MLE of Standard Deviation	43.24	
nu star	7.217	
Approximate Chi Square Value (.05)	2.29	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 63.36
Adjusted Chi Square Value	1.42	95% Jackknife UCL 70.07
		95% Standard Bootstrap UCL 60.52
Anderson-Darling Test Statistic	0.571	95% Bootstrap-t UCL 207.8
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 248.5
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL 66.15
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 74.48
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 112.6
		97.5% Chebyshev(Mean, Sd) UCL 146.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 214
95% Approximate Gamma UCL	105.7	
95% Adjusted Gamma UCL	170.4	

Potential UCL to Use	Use 95% Approximate Gamma UCL 105.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_LPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHND0

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0146	Minimum of Log Data	-4.227
Maximum	15.56	Maximum of Log Data	2.745
Mean	2.72	Mean of log Data	-1.853
Median	0.11	SD of log Data	2.634
SD	6.293		
Coefficient of Variation	2.314		
Skewness	2.445		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.897	95% H-UCL	691185
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.665
95% Adjusted-CLT UCL	9.686	97.5% Chebyshev (MVUE) UCL	8.93
95% Modified-t UCL	8.324	99% Chebyshev (MVUE) UCL	13.38

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.236	Data appear Gamma Distributed at 5% Significance Level
Theta Star	11.54	
MLE of Mean	2.72	
MLE of Standard Deviation	5.603	
nu star	2.828	
Approximate Chi Square Value (.05)	0.323	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.946
Adjusted Chi Square Value	0.145	95% Jackknife UCL 7.897
		95% Standard Bootstrap UCL 6.549
Anderson-Darling Test Statistic	0.774	95% Bootstrap-t UCL 213.6
Anderson-Darling 5% Critical Value	0.785	95% Hall's Bootstrap UCL 131
Kolmogorov-Smirnov Test Statistic	0.325	95% Percentile Bootstrap UCL 7.816
Kolmogorov-Smirnov 5% Critical Value	0.36	95% BCA Bootstrap UCL 10.38
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 13.92
		97.5% Chebyshev(Mean, Sd) UCL 18.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.28
95% Approximate Gamma UCL	23.79	
95% Adjusted Gamma UCL	52.89	

Potential UCL to Use Use 95% Adjusted Gamma UCL 52.89

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_LPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHNDDL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0466	Minimum of Log Data	-3.066
Maximum	15.56	Maximum of Log Data	2.745
Mean	2.748	Mean of log Data	-1.377
Median	0.162	SD of log Data	2.257
SD	6.279		
Coefficient of Variation	2.285		
Skewness	2.445		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.808
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	7.913	95% H-UCL	19837
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.105
95% Adjusted-CLT UCL	9.698	97.5% Chebyshev (MVUE) UCL	8.141
95% Modified-t UCL	8.34	99% Chebyshev (MVUE) UCL	12.14

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.256	Data appear Lognormal at 5% Significance Level
Theta Star	10.72	
MLE of Mean	2.748	
MLE of Standard Deviation	5.428	
nu star	3.075	
Approximate Chi Square Value (.05)	0.395	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.964
Adjusted Chi Square Value	0.178	95% Jackknife UCL 7.913
		95% Standard Bootstrap UCL 6.606
Anderson-Darling Test Statistic	0.943	95% Bootstrap-t UCL 147.2
Anderson-Darling 5% Critical Value	0.77	95% Hall's Bootstrap UCL 95.48
Kolmogorov-Smirnov Test Statistic	0.364	95% Percentile Bootstrap UCL 7.806
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL 7.957
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 13.92
		97.5% Chebyshev(Mean, Sd) UCL 18.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.25
95% Approximate Gamma UCL	21.39	
95% Adjusted Gamma UCL	47.54	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 28.25

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_MERCURY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_MERCURY

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.014	Minimum Detected	-4.269
Maximum Detected	0.39	Maximum Detected	-0.942
Mean of Detected	0.122	Mean of Detected	-2.789
SD of Detected	0.156	SD of Detected	1.342
Minimum Non-Detect	0.032	Minimum Non-Detect	-3.442
Maximum Non-Detect	0.032	Maximum Non-Detect	-3.442

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.772	Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.104	Mean	-3.013
SD	0.146	SD	1.32
95% DL/2 (t) UCL	0.224	95% H-Stat (DL/2) UCL	4.266
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0237	Mean in Log Scale	-3.001
SD	0.217	SD in Log Scale	1.309
95% MLE (t) UCL	0.202	Mean in Original Scale	0.104
95% MLE (Tiku) UCL	0.244	SD in Original Scale	0.146
		95% Percentile Bootstrap UCL	0.205
		95% BCA Bootstrap UCL	0.237

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.478	Data appear Normal at 5% Significance Level
Theta Star	0.255	
nu star	4.776	
A-D Test Statistic	0.291	
5% A-D Critical Value	0.695	
K-S Test Statistic	0.695	
5% K-S Critical Value	0.366	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.014	Mean	0.104
Maximum	0.39	SD	0.133
Mean	0.105	SE of Mean	0.0607
Median	0.0425	95% KM (t) UCL	0.227
SD	0.145	95% KM (z) UCL	0.204
k star	0.521	95% KM (jackknife) UCL	0.224
Theta star	0.201	95% KM (bootstrap t) UCL	0.535
Nu star	6.253	95% KM (BCA) UCL	0.212
AppChi2	1.771	95% KM (Percentile Bootstrap) UCL	0.21
95% Gamma Approximate UCL	0.37	95% KM (Chebyshev) UCL	0.369
95% Adjusted Gamma UCL	0.629	97.5% KM (Chebyshev) UCL	0.484
		99% KM (Chebyshev) UCL	0.708
		Potential UCLs to Use	
		95% KM (t) UCL	0.227
		95% KM (Percentile Bootstrap) UCL	0.21

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NAPHTHALENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0049	Minimum of Log Data	-5.319
Maximum	8.3	Maximum of Log Data	2.116
Mean	1.407	Mean of log Data	-3.1
Median	0.0223	SD of log Data	2.767
SD	3.377		
Coefficient of Variation	2.401		
Skewness	2.449		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.504	Shapiro Wilk Test Statistic	0.813
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.185	95% H-UCL	952167
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.344
95% Adjusted-CLT UCL	5.147	97.5% Chebyshev (MVUE) UCL	3.144
95% Modified-t UCL	4.415	99% Chebyshev (MVUE) UCL	4.715

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.217	Data appear Lognormal at 5% Significance Level
Theta Star	6.481	
MLE of Mean	1.407	
MLE of Standard Deviation	3.019	
nu star	2.605	
Approximate Chi Square Value (.05)	0.266	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.675
Adjusted Chi Square Value	0.122	95% Jackknife UCL 4.185
		95% Standard Bootstrap UCL 3.472
Anderson-Darling Test Statistic	1.036	95% Bootstrap-t UCL 342.7
Anderson-Darling 5% Critical Value	0.798	95% Hall's Bootstrap UCL 379.8
Kolmogorov-Smirnov Test Statistic	0.401	95% Percentile Bootstrap UCL 4.154
Kolmogorov-Smirnov 5% Critical Value	0.363	95% BCA Bootstrap UCL 4.184
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.416
		97.5% Chebyshev(Mean, Sd) UCL 10.02
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.12
95% Approximate Gamma UCL	13.79	
95% Adjusted Gamma UCL	30.03	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 15.12

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NICKEL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.5	Minimum of Log Data	0.916
Maximum	37.4	Maximum of Log Data	3.622
Mean	13.17	Mean of log Data	2.096
Median	7.2	SD of log Data	1.086
SD	13.8		
Coefficient of Variation	1.048		
Skewness	1.357		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.923
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	24.52	95% H-UCL	126
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37.29
95% Adjusted-CLT UCL	25.76	97.5% Chebyshev (MVUE) UCL	47.84
95% Modified-t UCL	25.04	99% Chebyshev (MVUE) UCL	68.56

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.7	Data appear Normal at 5% Significance Level
Theta Star	18.81	
MLE of Mean	13.17	
MLE of Standard Deviation	15.74	
nu star	8.398	
Approximate Chi Square Value (.05)	2.967	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 22.43
Adjusted Chi Square Value	1.932	95% Jackknife UCL 24.52
		95% Standard Bootstrap UCL 21.63
Anderson-Darling Test Statistic	0.375	95% Bootstrap-t UCL 42.74
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL 69.19
Kolmogorov-Smirnov Test Statistic	0.262	95% Percentile Bootstrap UCL 21.83
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL 23.68
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 37.72
		97.5% Chebyshev(Mean, Sd) UCL 48.34
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 69.21
95% Approximate Gamma UCL	37.26	
95% Adjusted Gamma UCL	57.24	

Potential UCL to Use		Use 95% Student's-t UCL	24.52

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_OCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.00026	Minimum of Log Data	-8.255
Maximum	0.011	Maximum of Log Data	-4.51
Mean	0.0026	Mean of log Data	-6.862
Median	0.000665	SD of log Data	1.389
SD	0.0042		
Coefficient of Variation	1.618		
Skewness	2.242		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.641	Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.00606	95% H-UCL	0.0825
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00727
95% Adjusted-CLT UCL	0.0071	97.5% Chebyshev (MVUE) UCL	0.00948
95% Modified-t UCL	0.00632	99% Chebyshev (MVUE) UCL	0.0138

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.446	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.00583	
MLE of Mean	0.0026	
MLE of Standard Deviation	0.00389	
nu star	5.346	
Approximate Chi Square Value (.05)	1.315	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.00542
Adjusted Chi Square Value	0.727	95% Jackknife UCL 0.00606
		95% Standard Bootstrap UCL 0.00515
Anderson-Darling Test Statistic	0.628	95% Bootstrap-t UCL 0.0504
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL 0.0307
Kolmogorov-Smirnov Test Statistic	0.342	95% Percentile Bootstrap UCL 0.00574
Kolmogorov-Smirnov 5% Critical Value	0.345	95% BCA Bootstrap UCL 0.00648
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0101
		97.5% Chebyshev(Mean, Sd) UCL 0.0133
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0197
95% Approximate Gamma UCL	0.0106	
95% Adjusted Gamma UCL	0.0191	

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.0106

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_OCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDF

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0000029	Minimum of Log Data	-12.75
Maximum	0.000086	Maximum of Log Data	-9.361
Mean	2.283E-05	Mean of log Data	-11.28
Median	0.0000114	SD of log Data	1.132
SD	3.139E-05		
Coefficient of Variation	N/A		
Skewness	2.297		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.657	Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.866E-05	95% H-UCL	0.0002449
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.162E-05
95% Adjusted-CLT UCL	5.675E-05	97.5% Chebyshev (MVUE) UCL	7.928E-05
95% Modified-t UCL	5.066E-05	99% Chebyshev (MVUE) UCL	0.000114

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.599	Data appear Gamma Distributed at 5% Significance Level
Theta Star	3.811E-05	
MLE of Mean	2.283E-05	
MLE of Standard Deviation	2.95E-05	
nu star	7.19	
Approximate Chi Square Value (.05)	2.275	
Adjusted Level of Significance	0.0122	
Adjusted Chi Square Value	1.409	
Anderson-Darling Test Statistic	0.497	
Anderson-Darling 5% Critical Value	0.716	
Kolmogorov-Smirnov Test Statistic	0.285	
Kolmogorov-Smirnov 5% Critical Value	0.341	
Data appear Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	4.391E-05
95% Jackknife UCL	4.866E-05
95% Standard Bootstrap UCL	4.209E-05
95% Bootstrap-t UCL	0.0001371
95% Hall's Bootstrap UCL	0.0001423
95% Percentile Bootstrap UCL	4.697E-05
95% BCA Bootstrap UCL	0.000052
95% Chebyshev(Mean, Sd) UCL	7.869E-05
97.5% Chebyshev(Mean, Sd) UCL	0.0001029
99% Chebyshev(Mean, Sd) UCL	0.0001503

Assuming Gamma Distribution	
95% Approximate Gamma UCL	7.215E-05
95% Adjusted Gamma UCL	0.0001165

Potential UCL to Use	Use 95% Approximate Gamma UCL 7.215E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PHENANTHRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0034	Minimum of Log Data	-5.684
Maximum	2	Maximum of Log Data	0.693
Mean	0.358	Mean of log Data	-3.54
Median	0.0212	SD of log Data	2.47
SD	0.805		
Coefficient of Variation	2.247		
Skewness	2.438		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.532	Shapiro Wilk Test Statistic	0.876
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.021	95% H-UCL	20631
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.964
95% Adjusted-CLT UCL	1.248	97.5% Chebyshev (MVUE) UCL	1.289
95% Modified-t UCL	1.075	99% Chebyshev (MVUE) UCL	1.928

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.25	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.433	
MLE of Mean	0.358	
MLE of Standard Deviation	0.717	
nu star	3	
Approximate Chi Square Value (.05)	0.372	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.899
Adjusted Chi Square Value	0.167	95% Jackknife UCL 1.021
		95% Standard Bootstrap UCL 0.845
Anderson-Darling Test Statistic	0.734	95% Bootstrap-t UCL 17.85
Anderson-Darling 5% Critical Value	0.775	95% Hall's Bootstrap UCL 15.81
Kolmogorov-Smirnov Test Statistic	0.297	95% Percentile Bootstrap UCL 1.007
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL 1.034
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.791
		97.5% Chebyshev(Mean, Sd) UCL 2.411
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.629
95% Approximate Gamma UCL	2.886	
95% Adjusted Gamma UCL	6.427	

Potential UCL to Use Use 95% Adjusted Gamma UCL 6.427

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_PYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0051	Minimum of Log Data	-5.279
Maximum	1.4	Maximum of Log Data	0.336
Mean	0.263	Mean of log Data	-3.276
Median	0.029	SD of log Data	2.126
SD	0.558		
Coefficient of Variation	2.121		
Skewness	2.422		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.554	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.722	95% H-UCL	849.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.754
95% Adjusted-CLT UCL	0.879	97.5% Chebyshev (MVUE) UCL	1.003
95% Modified-t UCL	0.76	99% Chebyshev (MVUE) UCL	1.492

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.285	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.925	
MLE of Mean	0.263	
MLE of Standard Deviation	0.493	
nu star	3.415	
Approximate Chi Square Value (.05)	0.505	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.638
Adjusted Chi Square Value	0.232	95% Jackknife UCL 0.722
		95% Standard Bootstrap UCL 0.607
Anderson-Darling Test Statistic	0.652	95% Bootstrap-t UCL 8.251
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL 3.789
Kolmogorov-Smirnov Test Statistic	0.28	95% Percentile Bootstrap UCL 0.709
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.739
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.257
		97.5% Chebyshev(Mean, Sd) UCL 1.687
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.531
95% Approximate Gamma UCL	1.779	
95% Adjusted Gamma UCL	3.868	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.868

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_SILVER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_SILVER

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.038	Minimum of Log Data	-3.27
Maximum	0.94	Maximum of Log Data	-0.0619
Mean	0.27	Mean of log Data	-1.912
Median	0.125	SD of log Data	1.175
SD	0.345		
Coefficient of Variation	1.279		
Skewness	2.002		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.734	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.553	95% H-UCL	3.559
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.766
95% Adjusted-CLT UCL	0.624	97.5% Chebyshev (MVUE) UCL	0.988
95% Modified-t UCL	0.572	99% Chebyshev (MVUE) UCL	1.424

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.594	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.454	
MLE of Mean	0.27	
MLE of Standard Deviation	0.35	
nu star	7.124	
Approximate Chi Square Value (.05)	2.239	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.501
Adjusted Chi Square Value	1.382	95% Jackknife UCL 0.553
		95% Standard Bootstrap UCL 0.48
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL 1.625
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 1.587
Kolmogorov-Smirnov Test Statistic	0.234	95% Percentile Bootstrap UCL 0.513
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 0.586
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.883
		97.5% Chebyshev(Mean, Sd) UCL 1.148
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.67
95% Approximate Gamma UCL	0.858	
95% Adjusted Gamma UCL	1.389	

Potential UCL to Use		Use 95% Approximate Gamma UCL	0.858

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_TOTAL PCBS ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PCBs (ND=0)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.000884	Minimum of Log Data	-7.031
Maximum	0.0434	Maximum of Log Data	-3.137
Mean	0.01	Mean of log Data	-5.47
Median	0.00356	SD of log Data	1.345
SD	0.0165		
Coefficient of Variation	1.65		
Skewness	2.364		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.611	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.0236	95% H-UCL	0.256
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0275
95% Adjusted-CLT UCL	0.028	97.5% Chebyshev (MVUE) UCL	0.0358
95% Modified-t UCL	0.0246	99% Chebyshev (MVUE) UCL	0.0521

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.461	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0217	
MLE of Mean	0.01	
MLE of Standard Deviation	0.0147	
nu star	5.53	
Approximate Chi Square Value (.05)	1.405	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0211
Adjusted Chi Square Value	0.788	95% Jackknife UCL 0.0236
		95% Standard Bootstrap UCL 0.0201
Anderson-Darling Test Statistic	0.594	95% Bootstrap-t UCL 0.111
Anderson-Darling 5% Critical Value	0.724	95% Hall's Bootstrap UCL 0.0873
Kolmogorov-Smirnov Test Statistic	0.285	95% Percentile Bootstrap UCL 0.023
Kolmogorov-Smirnov 5% Critical Value	0.344	95% BCA Bootstrap UCL 0.0246
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0394
		97.5% Chebyshev(Mean, Sd) UCL 0.0521
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.077
95% Approximate Gamma UCL	0.0394	
95% Adjusted Gamma UCL	0.0702	

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.0394

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_TOTAL PCBS NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PCBs (ND=DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.00696	Minimum of Log Data	-4.968
Maximum	0.0583	Maximum of Log Data	-2.842
Mean	0.017	Mean of log Data	-4.455
Median	0.00816	SD of log Data	0.827
SD	0.0204		
Coefficient of Variation	1.202		
Skewness	2.378		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.586	Shapiro Wilk Test Statistic	0.715
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.0337	95% H-UCL	0.061
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0376
95% Adjusted-CLT UCL	0.0393	97.5% Chebyshev (MVUE) UCL	0.0473
95% Modified-t UCL	0.0351	99% Chebyshev (MVUE) UCL	0.0662

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.845	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.0201	
MLE of Mean	0.017	
MLE of Standard Deviation	0.0185	
nu star	10.13	
Approximate Chi Square Value (.05)	4.026	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0306
Adjusted Chi Square Value	2.763	95% Jackknife UCL 0.0337
		95% Standard Bootstrap UCL 0.0295
Anderson-Darling Test Statistic	1.055	95% Bootstrap-t UCL 0.188
Anderson-Darling 5% Critical Value	0.708	95% Hall's Bootstrap UCL 0.11
Kolmogorov-Smirnov Test Statistic	0.339	95% Percentile Bootstrap UCL 0.033
Kolmogorov-Smirnov 5% Critical Value	0.338	95% BCA Bootstrap UCL 0.0347
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0532
		97.5% Chebyshev(Mean, Sd) UCL 0.0689
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0998
95% Approximate Gamma UCL	0.0427	
95% Adjusted Gamma UCL	0.0622	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 0.0532

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_WHO TEQ ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=0)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.19E-09	Minimum of Log Data	-19.94
Maximum	9.72E-06	Maximum of Log Data	-11.54
Mean	2.295E-06	Mean of log Data	-15.68
Median	4.054E-07	SD of log Data	3.564
SD	3.843E-06		
Coefficient of Variation	N/A		
Skewness	1.964		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.704	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	5.456E-06	95% H-UCL	198633
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.773E-05
95% Adjusted-CLT UCL	6.22E-06	97.5% Chebyshev (MVUE) UCL	3.737E-05
95% Modified-t UCL	5.666E-06	99% Chebyshev (MVUE) UCL	5.63E-05

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.242	Data appear Gamma Distributed at 5% Significance Level
Theta Star	9.488E-06	
MLE of Mean	2.295E-06	
MLE of Standard Deviation	4.666E-06	
nu star	2.903	
Approximate Chi Square Value (.05)	0.344	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 4.876E-06
Adjusted Chi Square Value	0.155	95% Jackknife UCL 5.456E-06
		95% Standard Bootstrap UCL 4.633E-06
Anderson-Darling Test Statistic	0.271	95% Bootstrap-t UCL 2.532E-05
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL 2.12E-05
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL 4.974E-06
Kolmogorov-Smirnov 5% Critical Value	0.359	95% BCA Bootstrap UCL 5.938E-06
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 9.134E-06
		97.5% Chebyshev(Mean, Sd) UCL 1.209E-05
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.791E-05
95% Approximate Gamma UCL	1.936E-05	
95% Adjusted Gamma UCL	4.311E-05	

Potential UCL to Use Use 95% Adjusted Gamma UCL 4.311E-05

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_WHO TEQ NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	7.841E-07	Minimum of Log Data	-14.06
Maximum	1.152E-05	Maximum of Log Data	-11.37
Mean	4.423E-06	Mean of log Data	-12.9
Median	2.587E-06	SD of log Data	1.234
SD	4.55E-06		
Coefficient of Variation	N/A		
Skewness	0.879		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.832	Shapiro Wilk Test Statistic	0.829
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.166E-06	95% H-UCL	8.134E-05
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.399E-05
95% Adjusted-CLT UCL	8.191E-06	97.5% Chebyshev (MVUE) UCL	1.81E-05
95% Modified-t UCL	8.277E-06	99% Chebyshev (MVUE) UCL	2.619E-05

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.614	Data appear Normal at 5% Significance Level
Theta Star	7.204E-06	
MLE of Mean	4.423E-06	
MLE of Standard Deviation	5.645E-06	
nu star	7.368	
Approximate Chi Square Value (.05)	2.375	
Adjusted Level of Significance	0.0122	
Adjusted Chi Square Value	1.483	
Anderson-Darling Test Statistic	0.549	
Anderson-Darling 5% Critical Value	0.715	
Kolmogorov-Smirnov Test Statistic	0.31	
Kolmogorov-Smirnov 5% Critical Value	0.341	
Data appear Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	7.479E-06
95% Jackknife UCL	8.166E-06
95% Standard Bootstrap UCL	7.214E-06
95% Bootstrap-t UCL	1.079E-05
95% Hall's Bootstrap UCL	1.026E-05
95% Percentile Bootstrap UCL	7.427E-06
95% BCA Bootstrap UCL	7.553E-06
95% Chebyshev(Mean, Sd) UCL	1.252E-05
97.5% Chebyshev(Mean, Sd) UCL	1.602E-05
99% Chebyshev(Mean, Sd) UCL	2.291E-05

Assuming Gamma Distribution	
95% Approximate Gamma UCL	1.372E-05
95% Adjusted Gamma UCL	2.198E-05

Potential UCL to Use	Use 95% Student's-t UCL 8.166E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SS_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ZINC

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	30.1	Minimum of Log Data	3.405
Maximum	429	Maximum of Log Data	6.061
Mean	131.7	Mean of log Data	4.391
Median	61.9	SD of log Data	1.037
SD	154.8		
Coefficient of Variation	1.175		
Skewness	1.906		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.74	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	259.1	95% H-UCL	996.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	346.4
95% Adjusted-CLT UCL	288.2	97.5% Chebyshev (MVUE) UCL	443
95% Modified-t UCL	267.3	99% Chebyshev (MVUE) UCL	632.7

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.691	Data appear Gamma Distributed at 5% Significance Level
Theta Star	190.6	
MLE of Mean	131.7	
MLE of Standard Deviation	158.4	
nu star	8.293	
Approximate Chi Square Value (.05)	2.906	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 235.7
Adjusted Chi Square Value	1.884	95% Jackknife UCL 259.1
		95% Standard Bootstrap UCL 226.4
Anderson-Darling Test Statistic	0.485	95% Bootstrap-t UCL 698.4
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL 796.9
Kolmogorov-Smirnov Test Statistic	0.257	95% Percentile Bootstrap UCL 240.2
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL 277.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 407.2
		97.5% Chebyshev(Mean, Sd) UCL 526.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 760.6
95% Approximate Gamma UCL	375.9	
95% Adjusted Gamma UCL	579.7	

Potential UCL to Use	Use 95% Approximate Gamma UCL 375.9

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_2-METHYLNAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.016	Minimum Detected	-4.135
Maximum Detected	0.15	Maximum Detected	-1.897
Mean of Detected	0.0643	Mean of Detected	-3.178
SD of Detected	0.0633	SD of Detected	1.109
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.86	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0819	Mean	-2.714
SD	0.0422	SD	0.809
95% DL/2 (t) UCL	0.108	95% H-Stat (DL/2) UCL	0.979
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.178
		SD in Log Scale	0.934
		Mean in Original Scale	0.0603
		SD in Original Scale	0.053
		95% Percentile Bootstrap UCL	0.0891
		95% BCA Bootstrap UCL	0.0938

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.491	Data appear Normal at 5% Significance Level
Theta Star	0.131	
nu star	3.927	
A-D Test Statistic	0.418	
5% A-D Critical Value	0.664	
K-S Test Statistic	0.664	
5% K-S Critical Value	0.401	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.00301	Mean	0.0643
Maximum	0.15	SD	0.0548
Mean	0.0629	SE of Mean	0.0316
Median	0.0519	95% KM (t) UCL	0.123
SD	0.0545	95% KM (z) UCL	0.116
k star	0.827	95% KM (jackknife) UCL	0.128
Theta star	0.076	95% KM (bootstrap t) UCL	0.19
Nu star	14.88	95% KM (BCA) UCL	0.117
AppChi2	7.181	95% KM (Percentile Bootstrap) UCL	0.117
95% Gamma Approximate UCL	0.13	95% KM (Chebyshev) UCL	0.202
95% Adjusted Gamma UCL	N/A	97.5% KM (Chebyshev) UCL	0.262
		99% KM (Chebyshev) UCL	0.379
		Potential UCLs to Use	
		95% KM (t) UCL	0.123
		95% KM (Percentile Bootstrap) UCL	0.117

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ALUMINUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	25.9	Minimum of Log Data	3.254
Maximum	106	Maximum of Log Data	4.663
Mean	44.86	Mean of log Data	3.673
Median	33.6	SD of log Data	0.501
SD	28.25		
Coefficient of Variation	0.63		
Skewness	1.771		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.69	Shapiro Wilk Test Statistic	0.773
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	62.36	95% H-UCL	66.19
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	76.37
95% Adjusted-CLT UCL	66.28	97.5% Chebyshev (MVUE) UCL	90.41
95% Modified-t UCL	63.29	99% Chebyshev (MVUE) UCL	118

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.729	Data do not follow a Discernable Distribution (0.05)
Theta Star	16.44	
MLE of Mean	44.86	
MLE of Standard Deviation	27.16	
nu star	49.11	
Approximate Chi Square Value (.05)	34.02	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 60.34
Adjusted Chi Square Value	31.4	95% Jackknife UCL 62.36
		95% Standard Bootstrap UCL 59.53
Anderson-Darling Test Statistic	1.151	95% Bootstrap-t UCL 139.8
Anderson-Darling 5% Critical Value	0.725	95% Hall's Bootstrap UCL 167.9
Kolmogorov-Smirnov Test Statistic	0.356	95% Percentile Bootstrap UCL 60.82
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL 65.27
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 85.89
		97.5% Chebyshev(Mean, Sd) UCL 103.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 138.5
95% Approximate Gamma UCL	64.75	
95% Adjusted Gamma UCL	70.17	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 85.89

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ANTIMONY

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.12	Minimum of Log Data	-2.12
Maximum	0.3	Maximum of Log Data	-1.204
Mean	0.212	Mean of log Data	-1.594
Median	0.19	SD of log Data	0.318
SD	0.0653		
Coefficient of Variation	0.308		
Skewness	0.202		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.253

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.25
95% Modified-t UCL	0.253

Assuming Lognormal Distribution

95% H-UCL	0.268
95% Chebyshev (MVUE) UCL	0.311
97.5% Chebyshev (MVUE) UCL	0.354
99% Chebyshev (MVUE) UCL	0.438

Gamma Distribution Test

k star (bias corrected)	7.791
Theta Star	0.0272
MLE of Mean	0.212
MLE of Standard Deviation	0.076
nu star	140.2
Approximate Chi Square Value (.05)	113.9
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	108.9
Anderson-Darling Test Statistic	0.365
Anderson-Darling 5% Critical Value	0.722
Kolmogorov-Smirnov Test Statistic	0.194
Kolmogorov-Smirnov 5% Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.261
95% Adjusted Gamma UCL	0.273

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.248
95% Jackknife UCL	0.253
95% Standard Bootstrap UCL	0.246
95% Bootstrap-t UCL	0.255
95% Hall's Bootstrap UCL	0.244
95% Percentile Bootstrap UCL	0.248
95% BCA Bootstrap UCL	0.249
95% Chebyshev(Mean, Sd) UCL	0.307
97.5% Chebyshev(Mean, Sd) UCL	0.348
99% Chebyshev(Mean, Sd) UCL	0.429

Potential UCL to Use	Use 95% Student's-t UCL 0.253

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ARSENIC

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.6	Minimum of Log Data	0.956
Maximum	6.4	Maximum of Log Data	1.856
Mean	3.956	Mean of log Data	1.339
Median	3.6	SD of log Data	0.281
SD	1.18		
Coefficient of Variation	0.298		
Skewness	1.136		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	4.687

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	4.762
95% Modified-t UCL	4.712

Assuming Lognormal Distribution

95% H-UCL	4.834
95% Chebyshev (MVUE) UCL	5.569
97.5% Chebyshev (MVUE) UCL	6.269
99% Chebyshev (MVUE) UCL	7.645

Gamma Distribution Test

k star (bias corrected)	9.376
Theta Star	0.422
MLE of Mean	3.956
MLE of Standard Deviation	1.292
nu star	168.8
Approximate Chi Square Value (.05)	139.7
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	134.2
Anderson-Darling Test Statistic	0.346
Anderson-Darling 5% Critical Value	0.721
Kolmogorov-Smirnov Test Statistic	0.229
Kolmogorov-Smirnov 5% Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	4.778
95% Adjusted Gamma UCL	4.976

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	4.603
95% Jackknife UCL	4.687
95% Standard Bootstrap UCL	4.559
95% Bootstrap-t UCL	5.051
95% Hall's Bootstrap UCL	5.915
95% Percentile Bootstrap UCL	4.611
95% BCA Bootstrap UCL	4.7
95% Chebyshev(Mean, Sd) UCL	5.67
97.5% Chebyshev(Mean, Sd) UCL	6.412
99% Chebyshev(Mean, Sd) UCL	7.87

Potential UCL to Use

Use 95% Student's-t UCL 4.687

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_CHROMIUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.4	Minimum of Log Data	1.224
Maximum	14.2	Maximum of Log Data	2.653
Mean	6.4	Mean of log Data	1.688
Median	3.8	SD of log Data	0.588
SD	4.238		
Coefficient of Variation	0.662		
Skewness	1.128		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.724
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.735
Shapiro Wilk Critical Value	0.829

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	9.027
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	9.291
95% Modified-t UCL	9.115

Assuming Lognormal Distribution

95% H-UCL	10.6
95% Chebyshev (MVUE) UCL	11.76
97.5% Chebyshev (MVUE) UCL	14.13
99% Chebyshev (MVUE) UCL	18.78

Gamma Distribution Test

k star (bias corrected)	2.156
Theta Star	2.968
MLE of Mean	6.4
MLE of Standard Deviation	4.358
nu star	38.82
Approximate Chi Square Value (.05)	25.55
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	23.3
Anderson-Darling Test Statistic	1.287
Anderson-Darling 5% Critical Value	0.727
Kolmogorov-Smirnov Test Statistic	0.384
Kolmogorov-Smirnov 5% Critical Value	0.281

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	9.725
95% Adjusted Gamma UCL	10.66

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL	8.723
95% Jackknife UCL	9.027
95% Standard Bootstrap UCL	8.595
95% Bootstrap-t UCL	10.8
95% Hall's Bootstrap UCL	7.917
95% Percentile Bootstrap UCL	8.7
95% BCA Bootstrap UCL	9.078
95% Chebyshev(Mean, Sd) UCL	12.56
97.5% Chebyshev(Mean, Sd) UCL	15.22
99% Chebyshev(Mean, Sd) UCL	20.45

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 12.56

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_COBALT.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COBALT

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.26	Minimum of Log Data	-1.347
Maximum	0.68	Maximum of Log Data	-0.386
Mean	0.402	Mean of log Data	-0.952
Median	0.36	SD of log Data	0.298
SD	0.131		
Coefficient of Variation	0.325		
Skewness	1.301		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.886
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	0.483

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.494
95% Modified-t UCL	0.486

Assuming Lognormal Distribution

95% H-UCL	0.499
95% Chebyshev (MVUE) UCL	0.576
97.5% Chebyshev (MVUE) UCL	0.652
99% Chebyshev (MVUE) UCL	0.8

Gamma Distribution Test

k star (bias corrected)	8.193
Theta Star	0.0491
MLE of Mean	0.402
MLE of Standard Deviation	0.141
nu star	147.5
Approximate Chi Square Value (.05)	120.4
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	115.3
Anderson-Darling Test Statistic	0.342
Anderson-Darling 5% Critical Value	0.722
Kolmogorov-Smirnov Test Statistic	0.207
Kolmogorov-Smirnov 5% Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	0.493
95% Adjusted Gamma UCL	0.515

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	0.474
95% Jackknife UCL	0.483
95% Standard Bootstrap UCL	0.47
95% Bootstrap-t UCL	0.526
95% Hall's Bootstrap UCL	0.53
95% Percentile Bootstrap UCL	0.476
95% BCA Bootstrap UCL	0.489
95% Chebyshev(Mean, Sd) UCL	0.592
97.5% Chebyshev(Mean, Sd) UCL	0.674
99% Chebyshev(Mean, Sd) UCL	0.835

Potential UCL to Use

Use 95% Student's-t UCL 0.483

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COPPER

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.9	Minimum of Log Data	0.642
Maximum	2.6	Maximum of Log Data	0.956
Mean	2.189	Mean of log Data	0.778
Median	2.1	SD of log Data	0.113
SD	0.252		
Coefficient of Variation	0.115		
Skewness	0.641		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.888	Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.345	95% H-UCL	2.356
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.548
95% Adjusted-CLT UCL	2.346	97.5% Chebyshev (MVUE) UCL	2.703
95% Modified-t UCL	2.348	99% Chebyshev (MVUE) UCL	3.008

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	58.34	Data appear Normal at 5% Significance Level
Theta Star	0.0375	
MLE of Mean	2.189	
MLE of Standard Deviation	0.287	
nu star	1050	
Approximate Chi Square Value (.05)	975.9	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 2.327
Adjusted Chi Square Value	960.8	95% Jackknife UCL 2.345
		95% Standard Bootstrap UCL 2.317
Anderson-Darling Test Statistic	0.518	95% Bootstrap-t UCL 2.378
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 2.321
Kolmogorov-Smirnov Test Statistic	0.231	95% Percentile Bootstrap UCL 2.322
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 2.344
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.555
		97.5% Chebyshev(Mean, Sd) UCL 2.714
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.025
95% Approximate Gamma UCL	2.355	
95% Adjusted Gamma UCL	2.393	

Potential UCL to Use		Use 95% Student's-t UCL	2.345

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_FLUORANTHENE

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	3	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.013	Minimum Detected	-4.343
Maximum Detected	0.56	Maximum Detected	-0.58
Mean of Detected	0.153	Mean of Detected	-3.187
SD of Detected	0.271	SD of Detected	1.75
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	88.89%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.64	Shapiro Wilk Test Statistic	0.728
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.121	Mean	-2.718
SD	0.169	SD	1.16
95% DL/2 (t) UCL	0.226	95% H-Stat (DL/2) UCL	3.574
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.577
		SD in Log Scale	1.292
		Mean in Original Scale	0.0832
		SD in Original Scale	0.18
		95% Percentile Bootstrap UCL	0.2
		95% BCA Bootstrap UCL	0.26

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.288	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.532		
nu star	2.306		
A-D Test Statistic	0.815	**Nonparametric Statistics**	
5% A-D Critical Value	0.682	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.682	Mean	0.0779
5% K-S Critical Value	0.411	SD	0.17
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0656
		95% KM (t) UCL	0.2
Assuming Gamma Distribution		95% KM (z) UCL	0.186
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.19
Minimum	1E-09	95% KM (bootstrap t) UCL	3.181
Maximum	0.56	95% KM (BCA) UCL	0.2
Mean	0.149	95% KM (Percentile Bootstrap) UCL	0.2
Median	0.117	95% KM (Chebyshev) UCL	0.364
SD	0.178	97.5% KM (Chebyshev) UCL	0.488
k star	0.255	99% KM (Chebyshev) UCL	0.731
Theta star	0.584		
Nu star	4.587	Potential UCLs to Use	
AppChi2	0.966	97.5% KM (Chebyshev) UCL	0.488
95% Gamma Approximate UCL	0.706		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_HPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_HPAHND0

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	3

Raw Statistics

Minimum	0
Maximum	0.718
Mean	0.132
Median	0
SD	0.269
Coefficient of Variation	2.041
Skewness	1.852

Log-transformed Statistics

Log Statistics Not Avaliable

Warning: There are only 3 Distinct Values in this data

There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.571
Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Not Available

Assuming Normal Distribution

95% Student's-t UCL	0.298

Assuming Normal Distribution

95% Student's-t UCL	0.298

Assuming Lognormal Distribution

95% H-UCL	N/A

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.338
95% Modified-t UCL	0.307

Gamma Distribution Test

Gamma Statistics Not Available

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL	0.522

95% CLT UCL	0.279
95% Jackknife UCL	0.298
95% Standard Bootstrap UCL	N/A
95% Bootstrap-t UCL	N/A
95% Hall's Bootstrap UCL	N/A
95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A
95% Chebyshev(Mean, Sd) UCL	0.522
97.5% Chebyshev(Mean, Sd) UCL	0.691
99% Chebyshev(Mean, Sd) UCL	1.022

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_HPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_HPAHNDDL

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	4

Raw Statistics		Log-transformed Statistics	
Minimum	0.466	Minimum of Log Data	-0.764
Maximum	1.8	Maximum of Log Data	0.588
Mean	1.535	Mean of log Data	0.366
Median	1.71	SD of log Data	0.435
SD	0.427		
Coefficient of Variation	0.278		
Skewness	-2.449		

Warning: There are only 4 Distinct Values in this data

There are insufficient Distinct Values to perform some GOF tests and bootstrap methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values to compute bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10-15 or more observations for accurate and meaningful bootstrap results.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.584	Shapiro Wilk Test Statistic	0.521
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.799	95% H-UCL	2.213
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.569
95% Adjusted-CLT UCL	1.645	97.5% Chebyshev (MVUE) UCL	3.002
95% Modified-t UCL	1.78	99% Chebyshev (MVUE) UCL	3.854

Gamma Distribution Test		Data Distribution
k star (bias corrected)	5.541	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.277	
MLE of Mean	1.535	
MLE of Standard Deviation	0.652	
nu star	99.74	
Approximate Chi Square Value (.05)	77.7	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 1.769
Adjusted Chi Square Value	73.61	95% Jackknife UCL 1.799
		95% Standard Bootstrap UCL 1.755
Anderson-Darling Test Statistic	2.045	95% Bootstrap-t UCL 1.726
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 1.682
Kolmogorov-Smirnov Test Statistic	0.444	95% Percentile Bootstrap UCL 1.72
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL 1.673
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.155
		97.5% Chebyshev(Mean, Sd) UCL 2.423
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.951
95% Approximate Gamma UCL	1.97	
95% Adjusted Gamma UCL	2.08	

Potential UCL to Use	Use 95% Student's-t UCL 1.799
	or 95% Modified-t UCL 1.78

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_IRON

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	70.2	Minimum of Log Data	4.251
Maximum	246	Maximum of Log Data	5.505
Mean	115.7	Mean of log Data	4.669
Median	103	SD of log Data	0.406
SD	55.83		
Coefficient of Variation	0.482		
Skewness	1.857		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.785	Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	150.3	95% H-UCL	157.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	183
95% Adjusted-CLT UCL	158.6	97.5% Chebyshev (MVUE) UCL	212.6
95% Modified-t UCL	152.2	99% Chebyshev (MVUE) UCL	270.7

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	4.265	Data appear Gamma Distributed at 5% Significance Level
Theta Star	27.13	
MLE of Mean	115.7	
MLE of Standard Deviation	56.03	
nu star	76.76	
Approximate Chi Square Value (.05)	57.58	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 146.3
Adjusted Chi Square Value	54.09	95% Jackknife UCL 150.3
		95% Standard Bootstrap UCL 144.4
Anderson-Darling Test Statistic	0.561	95% Bootstrap-t UCL 186.7
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL 290
Kolmogorov-Smirnov Test Statistic	0.219	95% Percentile Bootstrap UCL 146
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL 156.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 196.8
		97.5% Chebyshev(Mean, Sd) UCL 231.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 300.9
95% Approximate Gamma UCL	154.3	
95% Adjusted Gamma UCL	164.2	

Potential UCL to Use	Use 95% Approximate Gamma UCL 154.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LEAD

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.021	Minimum Detected	-3.863
Maximum Detected	0.46	Maximum Detected	-0.777
Mean of Detected	0.125	Mean of Detected	-2.56
SD of Detected	0.147	SD of Detected	1.016
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.73	Shapiro Wilk Test Statistic	0.967
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.167	Mean	-2.353
SD	0.186	SD	1.136
95% DL/2 (t) UCL	0.282	95% H-Stat (DL/2) UCL	2.015
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.56
		SD in Log Scale	0.95
		Mean in Original Scale	0.12
		SD in Original Scale	0.138
		95% Percentile Bootstrap UCL	0.201
		95% BCA Bootstrap UCL	0.236

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.817	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.153	
nu star	13.08	
A-D Test Statistic	0.377	
5% A-D Critical Value	0.733	
K-S Test Statistic	0.733	
5% K-S Critical Value	0.301	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	0.021
Maximum	0.46
Mean	0.124
Median	0.077
SD	0.137
k star	0.945
Theta star	0.132
Nu star	17.01
AppChi2	8.677
95% Gamma Approximate UCL	0.244
95% Adjusted Gamma UCL	0.284

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.125
SD	0.137
SE of Mean	0.052
95% KM (t) UCL	0.222
95% KM (z) UCL	0.211
95% KM (jackknife) UCL	0.223
95% KM (bootstrap t) UCL	0.459
95% KM (BCA) UCL	0.215
95% KM (Percentile Bootstrap) UCL	0.214
95% KM (Chebyshev) UCL	0.352
97.5% KM (Chebyshev) UCL	0.45
99% KM (Chebyshev) UCL	0.642
Potential UCLs to Use	
95% KM (Chebyshev) UCL	0.352

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL_final\inp_PRBKGD-SW_N_LPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LPAHND0

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.02	Minimum of Log Data	-3.912
Maximum	0.789	Maximum of Log Data	-0.237
Mean	0.241	Mean of log Data	-2.212
Median	0.064	SD of log Data	1.418
SD	0.283		
Coefficient of Variation	1.174		
Skewness	1.176		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.803	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.416	95% H-UCL	2.503
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.784
95% Adjusted-CLT UCL	0.435	97.5% Chebyshev (MVUE) UCL	1.015
95% Modified-t UCL	0.422	99% Chebyshev (MVUE) UCL	1.469

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.58	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.415	
MLE of Mean	0.241	
MLE of Standard Deviation	0.316	
nu star	10.44	
Approximate Chi Square Value (.05)	4.216	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.396
Adjusted Chi Square Value	3.422	95% Jackknife UCL 0.416
		95% Standard Bootstrap UCL 0.386
Anderson-Darling Test Statistic	0.483	95% Bootstrap-t UCL 0.561
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL 0.426
Kolmogorov-Smirnov Test Statistic	0.26	95% Percentile Bootstrap UCL 0.397
Kolmogorov-Smirnov 5% Critical Value	0.289	95% BCA Bootstrap UCL 0.423
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.651
		97.5% Chebyshev(Mean, Sd) UCL 0.829
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.178
95% Approximate Gamma UCL	0.596	
95% Adjusted Gamma UCL	0.734	

Potential UCL to Use		Use 95% Approximate Gamma UCL	0.596

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\pahs\inp_PRBKGD-SW_N_LPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LPAHNDDL

General Statistics

Number of Valid Data	9	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	2
		Percent Non-Detects	22.22%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.157	Minimum Detected	0.146
Maximum Detected	1.62	Maximum Detected	0.482
Mean of Detected	1.461	Mean of Detected	0.373
SD of Detected	0.167	SD of Detected	0.121
Minimum Non-Detect	1.562	Minimum Non-Detect	0.446
Maximum Non-Detect	1.717	Maximum Non-Detect	0.541

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.873	Shapiro Wilk Test Statistic	0.856
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.319	Mean	0.246
SD	0.318	SD	0.275
95% DL/2 (t) UCL	1.516	95% H-Stat (DL/2) UCL	1.897
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.364
		SD in Log Scale	0.107
		Mean in Original Scale	1.446
		SD in Original Scale	0.15
		95% Percentile Bootstrap UCL	1.52
		95% BCA Bootstrap UCL	1.518

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	47.5	Data appear Normal at 5% Significance Level
Theta Star	0.0308	
nu star	664.9	
A-D Test Statistic	0.515	
5% A-D Critical Value	0.708	
K-S Test Statistic	0.708	
5% K-S Critical Value	0.311	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	1.157	Mean	1.449
Maximum	1.62	SD	0.156
Mean	1.462	SE of Mean	0.0631
Median	1.519	95% KM (t) UCL	1.566
SD	0.147	95% KM (z) UCL	1.552
k star	68.86	95% KM (jackknife) UCL	1.57
Theta star	0.0212	95% KM (bootstrap t) UCL	1.547
Nu star	1239	95% KM (BCA) UCL	1.541
AppChi2	1159	95% KM (Percentile Bootstrap) UCL	1.544
95% Gamma Approximate UCL	1.564	95% KM (Chebyshev) UCL	1.724
95% Adjusted Gamma UCL	1.586	97.5% KM (Chebyshev) UCL	1.843
		99% KM (Chebyshev) UCL	2.077
		Potential UCLs to Use	
		95% KM (t) UCL	1.566
		95% KM (Percentile Bootstrap) UCL	1.544

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_MANGANESE

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	20.9	Minimum of Log Data	3.04
Maximum	85.4	Maximum of Log Data	4.447
Mean	43.73	Mean of log Data	3.633
Median	27.6	SD of log Data	0.556
SD	25.95		
Coefficient of Variation	0.593		
Skewness	0.85		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.771	Shapiro Wilk Test Statistic	0.82
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	59.82	95% H-UCL	69.81
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	78.91
95% Adjusted-CLT UCL	60.58	97.5% Chebyshev (MVUE) UCL	94.31
95% Modified-t UCL	60.23	99% Chebyshev (MVUE) UCL	124.6

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	2.479	Data do not follow a Discernable Distribution (0.05)
Theta Star	17.64	
MLE of Mean	43.73	
MLE of Standard Deviation	27.78	
nu star	44.63	
Approximate Chi Square Value (.05)	30.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 57.96
Adjusted Chi Square Value	27.84	95% Jackknife UCL 59.82
		95% Standard Bootstrap UCL 57.24
Anderson-Darling Test Statistic	0.94	95% Bootstrap-t UCL 63.89
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL 53.31
Kolmogorov-Smirnov Test Statistic	0.291	95% Percentile Bootstrap UCL 57.54
Kolmogorov-Smirnov 5% Critical Value	0.281	95% BCA Bootstrap UCL 59.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 81.44
		97.5% Chebyshev(Mean, Sd) UCL 97.75
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 129.8
95% Approximate Gamma UCL	64.4	
95% Adjusted Gamma UCL	70.11	

Potential UCL to Use	Use 95% Chebyshev (Mean, Sd) UCL 81.44

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NAPHTHALENE

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
		Percent Non-Detects	44.44%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.042	Minimum Detected	-3.17
Maximum Detected	0.36	Maximum Detected	-1.022
Mean of Detected	0.142	Mean of Detected	-2.327
SD of Detected	0.138	SD of Detected	0.956
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	77.78%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk Test Statistic	0.86
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.122	Mean	-2.333
SD	0.101	SD	0.676
95% DL/2 (t) UCL	0.184	95% H-Stat (DL/2) UCL	0.638
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.593
		SD in Log Scale	0.79
		Mean in Original Scale	0.104
		SD in Original Scale	0.108
		95% Percentile Bootstrap UCL	0.165
		95% BCA Bootstrap UCL	0.192

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.722	Data appear Normal at 5% Significance Level
Theta Star	0.197	
nu star	7.225	
A-D Test Statistic	0.508	
5% A-D Critical Value	0.687	
K-S Test Statistic	0.687	
5% K-S Critical Value	0.362	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.042	Mean	0.101
Maximum	0.36	SD	0.103
Mean	0.141	SE of Mean	0.0385
Median	0.14	95% KM (t) UCL	0.173
SD	0.0981	95% KM (z) UCL	0.165
k star	1.754	95% KM (jackknife) UCL	0.169
Theta star	0.0802	95% KM (bootstrap t) UCL	0.582
Nu star	31.58	95% KM (BCA) UCL	0.183
AppChi2	19.74	95% KM (Percentile Bootstrap) UCL	0.173
95% Gamma Approximate UCL	0.225	95% KM (Chebyshev) UCL	0.269
95% Adjusted Gamma UCL	0.25	97.5% KM (Chebyshev) UCL	0.342
		99% KM (Chebyshev) UCL	0.484
		Potential UCLs to Use	
		95% KM (t) UCL	0.173
		95% KM (Percentile Bootstrap) UCL	0.173

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NICKEL

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	4.3	Minimum of Log Data	1.459
Maximum	6.6	Maximum of Log Data	1.887
Mean	5.189	Mean of log Data	1.637
Median	5	SD of log Data	0.143
SD	0.759		
Coefficient of Variation	0.146		
Skewness	0.709		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	5.659	95% H-UCL	5.704
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.264
95% Adjusted-CLT UCL	5.669	97.5% Chebyshev (MVUE) UCL	6.73
95% Modified-t UCL	5.669	99% Chebyshev (MVUE) UCL	7.645

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	36.48	Data appear Normal at 5% Significance Level
Theta Star	0.142	
MLE of Mean	5.189	
MLE of Standard Deviation	0.859	
nu star	656.7	
Approximate Chi Square Value (.05)	598.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 5.605
Adjusted Chi Square Value	586.5	95% Jackknife UCL 5.659
		95% Standard Bootstrap UCL 5.583
Anderson-Darling Test Statistic	0.23	95% Bootstrap-t UCL 5.774
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 5.695
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL 5.589
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 5.644
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 6.292
		97.5% Chebyshev(Mean, Sd) UCL 6.769
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 7.706
95% Approximate Gamma UCL	5.696	
95% Adjusted Gamma UCL	5.811	

Potential UCL to Use		Use 95% Student's-t UCL	5.659

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_PHENANTHRENE

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
		Percent Non-Detects	44.44%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	0.13	Maximum Detected	-2.04
Mean of Detected	0.0878	Mean of Detected	-2.482
SD of Detected	0.0312	SD of Detected	0.351
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.915	Shapiro Wilk Test Statistic	0.934
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0916	Mean	-2.42
SD	0.0225	SD	0.26
95% DL/2 (t) UCL	0.106	95% H-Stat (DL/2) UCL	0.307
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.482
		SD in Log Scale	0.293
		Mean in Original Scale	0.0868
		SD in Original Scale	0.0257
		95% Percentile Bootstrap UCL	0.101
		95% BCA Bootstrap UCL	0.101

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	4.221	Data appear Normal at 5% Significance Level	
Theta Star	0.0208		
nu star	42.21		
A-D Test Statistic	0.307	**Nonparametric Statistics**	
5% A-D Critical Value	0.679	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.679	Mean	0.0878
5% K-S Critical Value	0.358	SD	0.0279
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0139
		95% KM (t) UCL	0.114
Assuming Gamma Distribution		95% KM (z) UCL	0.111
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.115
Minimum	0.057	95% KM (bootstrap t) UCL	0.153
Maximum	0.13	95% KM (BCA) UCL	0.11
Mean	0.0886	95% KM (Percentile Bootstrap) UCL	0.11
Median	0.0916	95% KM (Chebyshev) UCL	0.149
SD	0.0258	97.5% KM (Chebyshev) UCL	0.175
k star	8.813	99% KM (Chebyshev) UCL	0.226
Theta star	0.0101		
Nu star	158.6	Potential UCLs to Use	
AppChi2	130.5	95% KM (t) UCL	0.114
95% Gamma Approximate UCL	0.108	95% KM (Percentile Bootstrap) UCL	0.11
95% Adjusted Gamma UCL	0.112		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_SELENIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_SELENIUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	6.6	Minimum of Log Data	1.887
Maximum	17.1	Maximum of Log Data	2.839
Mean	10.29	Mean of log Data	2.276
Median	9.3	SD of log Data	0.347
SD	3.683		
Coefficient of Variation	0.358		
Skewness	0.74		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.902
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	12.57

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	12.63
95% Modified-t UCL	12.62

Assuming Lognormal Distribution

95% H-UCL	13.34
95% Chebyshev (MVUE) UCL	15.5
97.5% Chebyshev (MVUE) UCL	17.76
99% Chebyshev (MVUE) UCL	22.2

Gamma Distribution Test

k star (bias corrected)	6.284
Theta Star	1.637
MLE of Mean	10.29
MLE of Standard Deviation	4.104
nu star	113.1
Approximate Chi Square Value (.05)	89.57
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	85.15
Anderson-Darling Test Statistic	0.378
Anderson-Darling 5% Critical Value	0.722
Kolmogorov-Smirnov Test Statistic	0.201
Kolmogorov-Smirnov 5% Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	12.99
95% Adjusted Gamma UCL	13.67

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	12.31
95% Jackknife UCL	12.57
95% Standard Bootstrap UCL	12.19
95% Bootstrap-t UCL	13.15
95% Hall's Bootstrap UCL	12.41
95% Percentile Bootstrap UCL	12.24
95% BCA Bootstrap UCL	12.41
95% Chebyshev(Mean, Sd) UCL	15.64
97.5% Chebyshev(Mean, Sd) UCL	17.96
99% Chebyshev(Mean, Sd) UCL	22.5

Potential UCL to Use

Use 95% Student's-t UCL 12.57

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_THALLIUM

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.022	Minimum Detected	-3.817
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.0615	Mean of Detected	-2.92
SD of Detected	0.0319	SD of Detected	0.639
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.305	Mean	-1.683
SD	0.232	SD	1.237
95% DL/2 (t) UCL	0.449	95% H-Stat (DL/2) UCL	40.52
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.92
		SD in Log Scale	0.588
		Mean in Original Scale	0.0621
		SD in Original Scale	0.0331
		95% Percentile Bootstrap UCL	0.0799
		95% BCA Bootstrap UCL	0.0803

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.157	Data appear Normal at 5% Significance Level	
Theta Star	0.0531		
nu star	9.257		
A-D Test Statistic	0.362	**Nonparametric Statistics**	
5% A-D Critical Value	0.659	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.659	Mean	0.0615
5% K-S Critical Value	0.396	SD	0.0276
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0159
		95% KM (t) UCL	0.0911
Assuming Gamma Distribution		95% KM (z) UCL	0.0877
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0937
Minimum	0.0215	95% KM (bootstrap t) UCL	0.0898
Maximum	0.1	95% KM (BCA) UCL	0.087
Mean	0.0615	95% KM (Percentile Bootstrap) UCL	0.087
Median	0.0619	95% KM (Chebyshev) UCL	0.131
SD	0.0294	97.5% KM (Chebyshev) UCL	0.161
k star	2.73	99% KM (Chebyshev) UCL	0.22
Theta star	0.0225		
Nu star	49.13	Potential UCLs to Use	
AppChi2	34.04	95% KM (t) UCL	0.0911
95% Gamma Approximate UCL	0.0887	95% KM (Percentile Bootstrap) UCL	0.087
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_VANADIUM

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.53	Minimum Detected	-0.635
Maximum Detected	2.1	Maximum Detected	0.742
Mean of Detected	1.244	Mean of Detected	0.129
SD of Detected	0.543	SD of Detected	0.463
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.94	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.161	Mean	0.0377
SD	0.565	SD	0.512
95% DL/2 (t) UCL	1.511	95% H-Stat (DL/2) UCL	2.126
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.106	Mean in Log Scale	0.078
SD	0.623	SD in Log Scale	0.459
95% MLE (t) UCL	1.493	Mean in Original Scale	1.185
95% MLE (Tiku) UCL	1.558	SD in Original Scale	0.537
		95% Percentile Bootstrap UCL	1.474
		95% BCA Bootstrap UCL	1.499

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	3.691	Data appear Normal at 5% Significance Level
Theta Star	0.337	
nu star	59.05	
A-D Test Statistic	0.246	
5% A-D Critical Value	0.718	
K-S Test Statistic	0.718	
5% K-S Critical Value	0.295	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.53	Mean	1.185
Maximum	2.1	SD	0.508
Mean	1.2	SE of Mean	0.182
Median	1.2	95% KM (t) UCL	1.524
SD	0.524	95% KM (z) UCL	1.485
k star	4.07	95% KM (jackknife) UCL	1.523
Theta star	0.295	95% KM (bootstrap t) UCL	1.595
Nu star	73.26	95% KM (BCA) UCL	1.479
AppChi2	54.55	95% KM (Percentile Bootstrap) UCL	1.483
95% Gamma Approximate UCL	1.611	95% KM (Chebyshev) UCL	1.979
95% Adjusted Gamma UCL	1.718	97.5% KM (Chebyshev) UCL	2.323
		99% KM (Chebyshev) UCL	2.997
		Potential UCLs to Use	
		95% KM (t) UCL	1.524
		95% KM (Percentile Bootstrap) UCL	1.483

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\inp_PRBKGD-SW_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ZINC

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.6	Minimum of Log Data	1.281
Maximum	9	Maximum of Log Data	2.197
Mean	5.478	Mean of log Data	1.652
Median	5.1	SD of log Data	0.326
SD	1.867		
Coefficient of Variation	0.341		
Skewness	0.85		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.883
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.635

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	6.69
95% Modified-t UCL	6.665

Assuming Lognormal Distribution

95% H-UCL	6.959
95% Chebyshev (MVUE) UCL	8.073
97.5% Chebyshev (MVUE) UCL	9.199
99% Chebyshev (MVUE) UCL	11.41

Gamma Distribution Test

k star (bias corrected)	7.055
Theta Star	0.776
MLE of Mean	5.478
MLE of Standard Deviation	2.062
nu star	127
Approximate Chi Square Value (.05)	102
Adjusted Level of Significance	0.0231
Adjusted Chi Square Value	97.24
Anderson-Darling Test Statistic	0.47
Anderson-Darling 5% Critical Value	0.722
Kolmogorov-Smirnov Test Statistic	0.25
Kolmogorov-Smirnov 5% Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL	6.822
95% Adjusted Gamma UCL	7.154

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL	6.502
95% Jackknife UCL	6.635
95% Standard Bootstrap UCL	6.44
95% Bootstrap-t UCL	7.003
95% Hall's Bootstrap UCL	6.574
95% Percentile Bootstrap UCL	6.456
95% BCA Bootstrap UCL	6.589
95% Chebyshev(Mean, Sd) UCL	8.191
97.5% Chebyshev(Mean, Sd) UCL	9.365
99% Chebyshev(Mean, Sd) UCL	11.67

Potential UCL to Use

Use 95% Student's-t UCL 6.635

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_2-METHYLNAPHTHALENE.\
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0024	Minimum Detected	-6.032
Maximum Detected	0.63	Maximum Detected	-0.462
Mean of Detected	0.14	Mean of Detected	-3.86
SD of Detected	0.275	SD of Detected	2.229
Minimum Non-Detect	0.0067	Minimum Non-Detect	-5.006
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.606	Shapiro Wilk Test Statistic	0.932
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.117	Mean	-4.166
SD	0.252	SD	2.13
95% DL/2 (t) UCL	0.324	95% H-Stat (DL/2) UCL	675.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.2
		SD in Log Scale	2.161
		Mean in Original Scale	0.117
		SD in Original Scale	0.252
		95% Percentile Bootstrap UCL	0.318
		95% BCA Bootstrap UCL	0.333

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.275	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.507		
nu star	2.752		
A-D Test Statistic	0.513	**Nonparametric Statistics**	
5% A-D Critical Value	0.731	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.731	Mean	0.117
5% K-S Critical Value	0.378	SD	0.23
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.105
		95% KM (t) UCL	0.328
Assuming Gamma Distribution		95% KM (z) UCL	0.29
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.324
Minimum	1E-09	95% KM (bootstrap t) UCL	4.694
Maximum	0.63	95% KM (BCA) UCL	0.32
Mean	0.116	95% KM (Percentile Bootstrap) UCL	0.318
Median	0.00945	95% KM (Chebyshev) UCL	0.574
SD	0.252	97.5% KM (Chebyshev) UCL	0.772
k star	0.195	99% KM (Chebyshev) UCL	1.161
Theta star	0.598		
Nu star	2.337	**Potential UCLs to Use**	
AppChi2	0.207	95% KM (Chebyshev) UCL	0.574
95% Gamma Approximate UCL	1.316		
95% Adjusted Gamma UCL	2.687		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_2378-TCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_2,3,7,8-TCDF

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	7.1E-07	Minimum Detected	-14.16
Maximum Detected	0.000014	Maximum Detected	-11.18
Mean of Detected	4.488E-06	Mean of Detected	-13.05
SD of Detected	6.38E-06	SD of Detected	1.345
Minimum Non-Detect	4.5E-07	Minimum Non-Detect	-14.61
Maximum Non-Detect	0.0000006	Maximum Non-Detect	-14.33

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	33.33%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.891
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.079E-06	Mean	-13.75
SD	5.402E-06	SD	1.512
95% DL/2 (t) UCL	7.523E-06	95% H-Stat (DL/2) UCL	0.0001832
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.586E-06	Mean in Log Scale	-14.27
SD	6.466E-06	SD in Log Scale	2.164
95% MLE (t) UCL	6.905E-06	Mean in Original Scale	3.01E-06
95% MLE (Tiku) UCL	7.257E-06	SD in Original Scale	5.447E-06
		95% Percentile Bootstrap UCL	7.175E-06
		95% BCA Bootstrap UCL	7.776E-06

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.368	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	1.218E-05	
nu star	2.948	
A-D Test Statistic	0.489	**Nonparametric Statistics**
5% A-D Critical Value	0.669	Kaplan-Meier (KM) Method
K-S Test Statistic	0.669	Mean 3.228E-06
5% K-S Critical Value	0.404	SD 4.85E-06
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 2.287E-06
		95% KM (t) UCL 7.836E-06
Assuming Gamma Distribution		95% KM (z) UCL 6.989E-06
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 7.561E-06
Minimum	1E-09	95% KM (bootstrap t) UCL 2.346E-05
Maximum	0.000014	95% KM (BCA) UCL 7.62E-06
Mean	2.992E-06	95% KM (Percentile Bootstrap) UCL 7.47E-06
Median	8.25E-07	95% KM (Chebyshev) UCL 1.32E-05
SD	5.458E-06	97.5% KM (Chebyshev) UCL 1.751E-05
k star	0.234	99% KM (Chebyshev) UCL 2.598E-05
Theta star	1.277E-05	
Nu star	2.813	**Potential UCLs to Use**
AppChi2	0.319	95% KM (BCA) UCL 7.62E-06
95% Gamma Approximate UCL	2.637E-05	
95% Adjusted Gamma UCL	N/A	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_1234678-HPCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.000011	Minimum of Log Data	-11.42
Maximum	0.00043	Maximum of Log Data	-7.752
Mean	9.883E-05	Mean of log Data	-10.14
Median	0.000022	SD of log Data	1.365
SD	0.0001648		
Coefficient of Variation	N/A		
Skewness	2.292		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.619	Shapiro Wilk Test Statistic	0.851
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.0002344	95% H-UCL	0.0027
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0002647
95% Adjusted-CLT UCL	0.0002768	97.5% Chebyshev (MVUE) UCL	0.0003447
95% Modified-t UCL	0.0002449	99% Chebyshev (MVUE) UCL	0.0005019

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.442	**Data appear Lognormal at 5% Significance Level**
Theta Star	0.0002238	
MLE of Mean	9.883E-05	
MLE of Standard Deviation	0.0001487	
nu star	5.3	
Approximate Chi Square Value (.05)	1.293	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0002095
Adjusted Chi Square Value	0.713	95% Jackknife UCL 0.0002344
		95% Standard Bootstrap UCL 0.0001991
Anderson-Darling Test Statistic	0.761	95% Bootstrap-t UCL 0.00285
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL 0.00193
Kolmogorov-Smirnov Test Statistic	0.364	95% Percentile Bootstrap UCL 0.0002238
Kolmogorov-Smirnov 5% Critical Value	0.345	95% BCA Bootstrap UCL 0.0002485
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0003921
		97.5% Chebyshev(Mean, Sd) UCL 0.000519
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0007683
95% Approximate Gamma UCL	0.000405	
95% Adjusted Gamma UCL	0.0007352	

Potential UCL to Use	Use 95% Chebyshev (MVUE) UCL 0.0002647

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_1234678-HPCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_1,2,3,4,6,7,8-HPCDF

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0000037	Minimum Detected	-12.51
Maximum Detected	0.000095	Maximum Detected	-9.262
Mean of Detected	2.895E-05	Mean of Detected	-11.36
SD of Detected	4.424E-05	SD of Detected	1.508
Minimum Non-Detect	0.0000022	Minimum Non-Detect	-13.03
Maximum Non-Detect	0.0000024	Maximum Non-Detect	-12.94

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	33.33%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.703	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.968E-05	Mean	-12.13
SD	3.716E-05	SD	1.674
95% DL/2 (t) UCL	5.025E-05	95% H-Stat (DL/2) UCL	0.00286
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	8.972E-06	Mean in Log Scale	-12.71
SD	4.47E-05	SD in Log Scale	2.407
95% MLE (t) UCL	4.575E-05	Mean in Original Scale	1.937E-05
95% MLE (Tiku) UCL	4.817E-05	SD in Original Scale	3.735E-05
		95% Percentile Bootstrap UCL	4.825E-05
		95% BCA Bootstrap UCL	5.187E-05

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.334	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	8.657E-05		
nu star	2.675		
A-D Test Statistic	0.525	**Nonparametric Statistics**	
5% A-D Critical Value	0.674	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.674	Mean	2.053E-05
5% K-S Critical Value	0.407	SD	3.347E-05
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.578E-05
		95% KM (t) UCL	5.233E-05
Assuming Gamma Distribution		95% KM (z) UCL	4.649E-05
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.063E-05
Minimum	1E-09	95% KM (bootstrap t) UCL	0.0001748
Maximum	0.000095	95% KM (BCA) UCL	0.0000509
Mean	0.0000193	95% KM (Percentile Bootstrap) UCL	4.955E-05
Median	0.0000039	95% KM (Chebyshev) UCL	8.931E-05
SD	3.739E-05	97.5% KM (Chebyshev) UCL	0.0001191
k star	0.212	99% KM (Chebyshev) UCL	0.0001775
Theta star	9.084E-05		
Nu star	2.55	**Potential UCLs to Use**	
AppChi2	0.253	95% KM (BCA) UCL	0.0000509
95% Gamma Approximate UCL	0.0001949		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_ANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ANTHRACENE

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0018	Minimum Detected	-6.32
Maximum Detected	0.65	Maximum Detected	-0.431
Mean of Detected	0.143	Mean of Detected	-3.966
SD of Detected	0.284	SD of Detected	2.352
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0064	Maximum Non-Detect	-5.051

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.599	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.119	Mean	-4.262
SD	0.26	SD	2.225
95% DL/2 (t) UCL	0.334	95% H-Stat (DL/2) UCL	1754
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.329
		SD in Log Scale	2.284
		Mean in Original Scale	0.119
		SD in Original Scale	0.26
		95% Percentile Bootstrap UCL	0.329
		95% BCA Bootstrap UCL	0.345

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.268	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.533		
nu star	2.675		
A-D Test Statistic	0.5	**Nonparametric Statistics**	
5% A-D Critical Value	0.734	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.734	Mean	0.119
5% K-S Critical Value	0.378	SD	0.238
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.109
		95% KM (t) UCL	0.338
Assuming Gamma Distribution		95% KM (z) UCL	0.298
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.333
Minimum	1E-09	95% KM (bootstrap t) UCL	3.74
Maximum	0.65	95% KM (BCA) UCL	0.331
Mean	0.119	95% KM (Percentile Bootstrap) UCL	0.329
Median	0.0105	95% KM (Chebyshev) UCL	0.592
SD	0.261	97.5% KM (Chebyshev) UCL	0.797
k star	0.193	99% KM (Chebyshev) UCL	1.199
Theta star	0.615		
Nu star	2.317	**Potential UCLs to Use**	
AppChi2	0.203	95% KM (Chebyshev) UCL	0.592
95% Gamma Approximate UCL	1.358		
95% Adjusted Gamma UCL	2.752		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ARSENIC

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	2.2	Minimum of Log Data	0.788
Maximum	16.2	Maximum of Log Data	2.785
Mean	6.217	Mean of log Data	1.551
Median	3.75	SD of log Data	0.781
SD	5.466		
Coefficient of Variation	0.879		
Skewness	1.589		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.792	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10.71	95% H-UCL	21.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.35
95% Adjusted-CLT UCL	11.43	97.5% Chebyshev (MVUE) UCL	17.95
95% Modified-t UCL	10.95	99% Chebyshev (MVUE) UCL	25.02

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.091	**Data appear Normal at 5% Significance Level**	
Theta Star	5.7		
MLE of Mean	6.217		
MLE of Standard Deviation	5.953		
nu star	13.09		
Approximate Chi Square Value (.05)	5.952	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0122	95% CLT UCL	9.887
Adjusted Chi Square Value	4.335	95% Jackknife UCL	10.71
		95% Standard Bootstrap UCL	9.565
Anderson-Darling Test Statistic	0.457	95% Bootstrap-t UCL	27.95
Anderson-Darling 5% Critical Value	0.705	95% Hall's Bootstrap UCL	30.56
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL	9.717
Kolmogorov-Smirnov 5% Critical Value	0.336	95% BCA Bootstrap UCL	10.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15.94
		97.5% Chebyshev(Mean, Sd) UCL	20.15
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	28.42
95% Approximate Gamma UCL	13.67		
95% Adjusted Gamma UCL	18.77		

Potential UCL to Use		
	Use 95% Student's-t UCL	10.71

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_BENZOAANTHRACENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)ANTHRACENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	1.2	Maximum of Log Data	0.182
Mean	0.222	Mean of log Data	-3.561
Median	0.026	SD of log Data	2.208
SD	0.48		
Coefficient of Variation	2.159		
Skewness	2.432		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.545	Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.617	95% H-UCL	1387
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.639
95% Adjusted-CLT UCL	0.752	97.5% Chebyshev (MVUE) UCL	0.852
95% Modified-t UCL	0.649	99% Chebyshev (MVUE) UCL	1.269

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.276	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.805	
MLE of Mean	0.222	
MLE of Standard Deviation	0.423	
nu star	3.313	
Approximate Chi Square Value (.05)	0.471	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.544
Adjusted Chi Square Value	0.215	95% Jackknife UCL 0.617
		95% Standard Bootstrap UCL 0.518
Anderson-Darling Test Statistic	0.67	95% Bootstrap-t UCL 5.78
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL 3.982
Kolmogorov-Smirnov Test Statistic	0.308	95% Percentile Bootstrap UCL 0.608
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 0.625
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.076
		97.5% Chebyshev(Mean, Sd) UCL 1.445
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.171
95% Approximate Gamma UCL	1.564	
95% Adjusted Gamma UCL	3.428	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.428

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_BENZOAPYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(A)PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	1.1	Maximum of Log Data	0.0953
Mean	0.203	Mean of log Data	-3.572
Median	0.022	SD of log Data	2.112
SD	0.44		
Coefficient of Variation	2.162		
Skewness	2.433		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.543	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.565	95% H-UCL	554.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.549
95% Adjusted-CLT UCL	0.689	97.5% Chebyshev (MVUE) UCL	0.731
95% Modified-t UCL	0.595	99% Chebyshev (MVUE) UCL	1.087

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.282	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.722	
MLE of Mean	0.203	
MLE of Standard Deviation	0.383	
nu star	3.38	
Approximate Chi Square Value (.05)	0.493	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.499
Adjusted Chi Square Value	0.226	95% Jackknife UCL 0.565
		95% Standard Bootstrap UCL 0.475
Anderson-Darling Test Statistic	0.701	95% Bootstrap-t UCL 7.087
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 3.504
Kolmogorov-Smirnov Test Statistic	0.314	95% Percentile Bootstrap UCL 0.557
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.735
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.986
		97.5% Chebyshev(Mean, Sd) UCL 1.325
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.99
95% Approximate Gamma UCL	1.394	
95% Adjusted Gamma UCL	3.039	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.039

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_BENZOBFLUORANTHEN.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(B)FLUORANTHENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0056	Minimum of Log Data	-5.185
Maximum	1.9	Maximum of Log Data	0.642
Mean	0.343	Mean of log Data	-3.234
Median	0.0245	SD of log Data	2.159
SD	0.764		
Coefficient of Variation	2.23		
Skewness	2.44		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.531	Shapiro Wilk Test Statistic	0.88
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.971	95% H-UCL	1213
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.826
95% Adjusted-CLT UCL	1.187	97.5% Chebyshev (MVUE) UCL	1.099
95% Modified-t UCL	1.023	99% Chebyshev (MVUE) UCL	1.637

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.269	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	1.272	
MLE of Mean	0.343	
MLE of Standard Deviation	0.66	
nu star	3.23	
Approximate Chi Square Value (.05)	0.444	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.855
Adjusted Chi Square Value	0.201	95% Jackknife UCL 0.971
		95% Standard Bootstrap UCL 0.815
Anderson-Darling Test Statistic	0.809	95% Bootstrap-t UCL 21.57
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL 9.219
Kolmogorov-Smirnov Test Statistic	0.33	95% Percentile Bootstrap UCL 0.958
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 0.987
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.702
		97.5% Chebyshev(Mean, Sd) UCL 2.29
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.445
95% Approximate Gamma UCL	2.493	
95% Adjusted Gamma UCL	5.498	

Potential UCL to Use Use 95% Adjusted Gamma UCL 5.498

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_BENZOGHIPERYLENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_BENZO(GHI)PERYLENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0047	Minimum of Log Data	-5.36
Maximum	0.83	Maximum of Log Data	-0.186
Mean	0.154	Mean of log Data	-3.673
Median	0.018	SD of log Data	1.944
SD	0.331		
Coefficient of Variation	2.147		
Skewness	2.435		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.54	Shapiro Wilk Test Statistic	0.871
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.427	95% H-UCL	114
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.389
95% Adjusted-CLT UCL	0.521	97.5% Chebyshev (MVUE) UCL	0.516
95% Modified-t UCL	0.449	99% Chebyshev (MVUE) UCL	0.765

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.296	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	0.522	
MLE of Mean	0.154	
MLE of Standard Deviation	0.284	
nu star	3.55	
Approximate Chi Square Value (.05)	0.552	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.377
Adjusted Chi Square Value	0.257	95% Jackknife UCL 0.427
		95% Standard Bootstrap UCL 0.354
Anderson-Darling Test Statistic	0.793	95% Bootstrap-t UCL 6.181
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL 3.013
Kolmogorov-Smirnov Test Statistic	0.333	95% Percentile Bootstrap UCL 0.421
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 0.434
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.744
		97.5% Chebyshev(Mean, Sd) UCL 0.999
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.501
95% Approximate Gamma UCL	0.992	
95% Adjusted Gamma UCL	2.131	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 2.131

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_CADMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CADMIUM

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.083	Minimum of Log Data	-2.489
Maximum	1.6	Maximum of Log Data	0.47
Mean	0.417	Mean of log Data	-1.491
Median	0.175	SD of log Data	1.119
SD	0.59		
Coefficient of Variation	1.414		
Skewness	2.266		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.651	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.903	95% H-UCL	4.085
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.079
95% Adjusted-CLT UCL	1.051	97.5% Chebyshev (MVUE) UCL	1.387
95% Modified-t UCL	0.94	99% Chebyshev (MVUE) UCL	1.992

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.582	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.717	
MLE of Mean	0.417	
MLE of Standard Deviation	0.547	
nu star	6.985	
Approximate Chi Square Value (.05)	2.162	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.813
Adjusted Chi Square Value	1.326	95% Jackknife UCL 0.903
		95% Standard Bootstrap UCL 0.78
Anderson-Darling Test Statistic	0.599	95% Bootstrap-t UCL 3.651
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 2.944
Kolmogorov-Smirnov Test Statistic	0.246	95% Percentile Bootstrap UCL 0.866
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 0.963
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.467
		97.5% Chebyshev(Mean, Sd) UCL 1.921
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.814
95% Approximate Gamma UCL	1.348	
95% Adjusted Gamma UCL	2.198	

Potential UCL to Use	Use 95% Approximate Gamma UCL 1.348

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHROMIUM

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	22.8	Minimum of Log Data	3.127
Maximum	225	Maximum of Log Data	5.416
Mean	61.72	Mean of log Data	3.699
Median	31.65	SD of log Data	0.858
SD	80.14		
Coefficient of Variation	1.299		
Skewness	2.429		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.554	Shapiro Wilk Test Statistic	0.681
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	127.6	95% H-UCL	237
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	136.3
95% Adjusted-CLT UCL	150.2	97.5% Chebyshev (MVUE) UCL	171.8
95% Modified-t UCL	133.1	99% Chebyshev (MVUE) UCL	241.5

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.772	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	79.98	
MLE of Mean	61.72	
MLE of Standard Deviation	70.26	
nu star	9.259	
Approximate Chi Square Value (.05)	3.484	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 115.5
Adjusted Chi Square Value	2.333	95% Jackknife UCL 127.6
		95% Standard Bootstrap UCL 111
Anderson-Darling Test Statistic	1.22	95% Bootstrap-t UCL 727.6
Anderson-Darling 5% Critical Value	0.71	95% Hall's Bootstrap UCL 661.4
Kolmogorov-Smirnov Test Statistic	0.451	95% Percentile Bootstrap UCL 126.1
Kolmogorov-Smirnov 5% Critical Value	0.339	95% BCA Bootstrap UCL 128.9
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 204.3
		97.5% Chebyshev(Mean, Sd) UCL 266
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 387.2
95% Approximate Gamma UCL	164	
95% Adjusted Gamma UCL	244.9	

Potential UCL to Use		
		Use 95% Chebyshev (Mean, Sd) UCL 204.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_CHRYSENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_CHRYSENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0038	Minimum of Log Data	-5.573
Maximum	1	Maximum of Log Data	0
Mean	0.186	Mean of log Data	-3.639
Median	0.0174	SD of log Data	2.09
SD	0.4		
Coefficient of Variation	2.148		
Skewness	2.427		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.547	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.515	95% H-UCL	425.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.498
95% Adjusted-CLT UCL	0.627	97.5% Chebyshev (MVUE) UCL	0.662
95% Modified-t UCL	0.542	99% Chebyshev (MVUE) UCL	0.984

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.283	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.657	
MLE of Mean	0.186	
MLE of Standard Deviation	0.35	
nu star	3.4	
Approximate Chi Square Value (.05)	0.5	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.454
Adjusted Chi Square Value	0.23	95% Jackknife UCL 0.515
		95% Standard Bootstrap UCL 0.43
Anderson-Darling Test Statistic	0.714	95% Bootstrap-t UCL 8.07
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 4.349
Kolmogorov-Smirnov Test Statistic	0.289	95% Percentile Bootstrap UCL 0.506
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.668
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.897
		97.5% Chebyshev(Mean, Sd) UCL 1.205
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.809
95% Approximate Gamma UCL	1.265	
95% Adjusted Gamma UCL	2.753	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 2.753

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_COPPER

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	4.6	Minimum of Log Data	1.526
Maximum	105	Maximum of Log Data	4.654
Mean	26.98	Mean of log Data	2.621
Median	10.85	SD of log Data	1.187
SD	39.01		
Coefficient of Variation	1.446		
Skewness	2.242		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.66	Shapiro Wilk Test Statistic	0.901
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	59.08	95% H-UCL	351
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	72.34
95% Adjusted-CLT UCL	68.76	97.5% Chebyshev (MVUE) UCL	93.38
95% Modified-t UCL	61.51	99% Chebyshev (MVUE) UCL	134.7

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.547	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	49.37	
MLE of Mean	26.98	
MLE of Standard Deviation	36.5	
nu star	6.559	
Approximate Chi Square Value (.05)	1.932	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 53.18
Adjusted Chi Square Value	1.158	95% Jackknife UCL 59.08
		95% Standard Bootstrap UCL 50.77
Anderson-Darling Test Statistic	0.549	95% Bootstrap-t UCL 209.2
Anderson-Darling 5% Critical Value	0.718	95% Hall's Bootstrap UCL 173.2
Kolmogorov-Smirnov Test Statistic	0.249	95% Percentile Bootstrap UCL 56.27
Kolmogorov-Smirnov 5% Critical Value	0.342	95% BCA Bootstrap UCL 65.35
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 96.41
		97.5% Chebyshev(Mean, Sd) UCL 126.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 185.5
95% Approximate Gamma UCL	91.61	
95% Adjusted Gamma UCL	152.9	

Potential UCL to Use		
		Use 95% Approximate Gamma UCL 91.61

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_DIBENZOAHANTHRAC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_DIBENZO(A,H)ANTHRACENE

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0026	Minimum Detected	-5.952
Maximum Detected	0.26	Maximum Detected	-1.347
Mean of Detected	0.0877	Mean of Detected	-3.393
SD of Detected	0.117	SD of Detected	1.908
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.786	Shapiro Wilk Test Statistic	0.949
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0595	Mean	-4.169
SD	0.1	SD	1.905
95% DL/2 (t) UCL	0.142	95% H-Stat (DL/2) UCL	88.59
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.242
		SD in Log Scale	1.979
		Mean in Original Scale	0.0593
		SD in Original Scale	0.1
		95% Percentile Bootstrap UCL	0.131
		95% BCA Bootstrap UCL	0.151

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.326	**Data appear Normal at 5% Significance Level**	
Theta Star	0.269		
nu star	2.611		
A-D Test Statistic	0.264	**Nonparametric Statistics**	
5% A-D Critical Value	0.675	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.675	Mean	0.0593
5% K-S Critical Value	0.407	SD	0.0917
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0432
		95% KM (t) UCL	0.146
Assuming Gamma Distribution		95% KM (z) UCL	0.13
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.14
Minimum	0.0026	95% KM (bootstrap t) UCL	0.307
Maximum	0.26	95% KM (BCA) UCL	0.149
Mean	0.0685	95% KM (Percentile Bootstrap) UCL	0.149
Median	0.0336	95% KM (Chebyshev) UCL	0.248
SD	0.0951	97.5% KM (Chebyshev) UCL	0.329
k star	0.508	99% KM (Chebyshev) UCL	0.49
Theta star	0.135		
Nu star	6.1	**Potential UCLs to Use**	
AppChi2	1.691	95% KM (t) UCL	0.146
95% Gamma Approximate UCL	0.247	95% KM (Percentile Bootstrap) UCL	0.149
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORANTHENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0039	Minimum of Log Data	-5.547
Maximum	2.2	Maximum of Log Data	0.788
Mean	0.403	Mean of log Data	-3.212
Median	0.0342	SD of log Data	2.394
SD	0.882		
Coefficient of Variation	2.188		
Skewness	2.43		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.544	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.129	95% H-UCL	12733
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.194
95% Adjusted-CLT UCL	1.377	97.5% Chebyshev (MVUE) UCL	1.595
95% Modified-t UCL	1.188	99% Chebyshev (MVUE) UCL	2.384

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.261	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	1.546	
MLE of Mean	0.403	
MLE of Standard Deviation	0.789	
nu star	3.13	
Approximate Chi Square Value (.05)	0.412	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.995
Adjusted Chi Square Value	0.186	95% Jackknife UCL 1.129
		95% Standard Bootstrap UCL 0.946
Anderson-Darling Test Statistic	0.65	95% Bootstrap-t UCL 13.03
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL 6.812
Kolmogorov-Smirnov Test Statistic	0.281	95% Percentile Bootstrap UCL 1.111
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL 1.468
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.972
		97.5% Chebyshev(Mean, Sd) UCL 2.651
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.985
95% Approximate Gamma UCL	3.063	
95% Adjusted Gamma UCL	6.792	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 6.792

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_FLUORENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_FLUORENE

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0021	Minimum Detected	-6.166
Maximum Detected	0.63	Maximum Detected	-0.462
Mean of Detected	0.169	Mean of Detected	-3.646
SD of Detected	0.307	SD of Detected	2.415
Minimum Non-Detect	0.0064	Minimum Non-Detect	-5.051
Maximum Non-Detect	0.0067	Maximum Non-Detect	-5.006

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.669	Shapiro Wilk Test Statistic	0.975
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.114	Mean	-4.338
SD	0.253	SD	2.156
95% DL/2 (t) UCL	0.322	95% H-Stat (DL/2) UCL	783.7
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.663
		SD in Log Scale	2.445
		Mean in Original Scale	0.113
		SD in Original Scale	0.253
		95% Percentile Bootstrap UCL	0.316
		95% BCA Bootstrap UCL	0.327

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.256	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.661		
nu star	2.05		
A-D Test Statistic	0.398	**Nonparametric Statistics**	
5% A-D Critical Value	0.697	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.697	Mean	0.114
5% K-S Critical Value	0.416	SD	0.231
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.109
		95% KM (t) UCL	0.333
Assuming Gamma Distribution		95% KM (z) UCL	0.293
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.321
Minimum	0.0021	95% KM (bootstrap t) UCL	2.58
Maximum	0.63	95% KM (BCA) UCL	0.322
Mean	0.118	95% KM (Percentile Bootstrap) UCL	0.322
Median	0.0157	95% KM (Chebyshev) UCL	0.589
SD	0.251	97.5% KM (Chebyshev) UCL	0.794
k star	0.308	99% KM (Chebyshev) UCL	1.198
Theta star	0.384		
Nu star	3.691	**Potential UCLs to Use**	
AppChi2	0.604	95% KM (BCA) UCL	0.322
95% Gamma Approximate UCL	0.722		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_HPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHND0

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0314	Minimum of Log Data	-3.461
Maximum	8.56	Maximum of Log Data	2.147
Mean	1.613	Mean of log Data	-1.442
Median	0.207	SD of log Data	2.128
SD	3.411		
Coefficient of Variation	2.115		
Skewness	2.424		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.553	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.419	95% H-UCL	5424
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.734
95% Adjusted-CLT UCL	5.376	97.5% Chebyshev (MVUE) UCL	6.3
95% Modified-t UCL	4.649	99% Chebyshev (MVUE) UCL	9.375

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.286	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	5.636	
MLE of Mean	1.613	
MLE of Standard Deviation	3.015	
nu star	3.435	
Approximate Chi Square Value (.05)	0.512	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.904
Adjusted Chi Square Value	0.236	95% Jackknife UCL 4.419
		95% Standard Bootstrap UCL 3.69
Anderson-Darling Test Statistic	0.637	95% Bootstrap-t UCL 39.16
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL 26.35
Kolmogorov-Smirnov Test Statistic	0.291	95% Percentile Bootstrap UCL 4.346
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 4.508
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.683
		97.5% Chebyshev(Mean, Sd) UCL 10.31
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.47
95% Approximate Gamma UCL	10.82	
95% Adjusted Gamma UCL	23.49	

Potential UCL to Use Use 95% Adjusted Gamma UCL 23.49

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_HPAHND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHND1/2DL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0378	Minimum of Log Data	-3.275
Maximum	8.615	Maximum of Log Data	2.154
Mean	1.625	Mean of log Data	-1.38
Median	0.207	SD of log Data	2.064
SD	3.432		
Coefficient of Variation	2.113		
Skewness	2.425		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.552	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.448	95% H-UCL	3217
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.585
95% Adjusted-CLT UCL	5.412	97.5% Chebyshev (MVUE) UCL	6.094
95% Modified-t UCL	4.679	99% Chebyshev (MVUE) UCL	9.06

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.291	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	5.59	
MLE of Mean	1.625	
MLE of Standard Deviation	3.014	
nu star	3.487	
Approximate Chi Square Value (.05)	0.53	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.929
Adjusted Chi Square Value	0.245	95% Jackknife UCL 4.448
		95% Standard Bootstrap UCL 3.701
Anderson-Darling Test Statistic	0.675	95% Bootstrap-t UCL 40.63
Anderson-Darling 5% Critical Value	0.758	95% Hall's Bootstrap UCL 22.91
Kolmogorov-Smirnov Test Statistic	0.297	95% Percentile Bootstrap UCL 4.375
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 4.574
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.733
		97.5% Chebyshev(Mean, Sd) UCL 10.38
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.57
95% Approximate Gamma UCL	10.68	
95% Adjusted Gamma UCL	23.08	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 23.08

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_HPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_HPAHNDDL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0442	Minimum of Log Data	-3.119
Maximum	8.67	Maximum of Log Data	2.16
Mean	1.636	Mean of log Data	-1.328
Median	0.207	SD of log Data	2.012
SD	3.454		
Coefficient of Variation	2.111		
Skewness	2.426		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.551	Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.477	95% H-UCL	2136
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.478
95% Adjusted-CLT UCL	5.447	97.5% Chebyshev (MVUE) UCL	5.946
95% Modified-t UCL	4.71	99% Chebyshev (MVUE) UCL	8.831

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.294	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	5.556	
MLE of Mean	1.636	
MLE of Standard Deviation	3.015	
nu star	3.533	
Approximate Chi Square Value (.05)	0.546	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.955
Adjusted Chi Square Value	0.254	95% Jackknife UCL 4.477
		95% Standard Bootstrap UCL 3.735
Anderson-Darling Test Statistic	0.709	95% Bootstrap-t UCL 41.73
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL 29.17
Kolmogorov-Smirnov Test Statistic	0.303	95% Percentile Bootstrap UCL 4.404
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 5.795
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.782
		97.5% Chebyshev(Mean, Sd) UCL 10.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.66
95% Approximate Gamma UCL	10.58	
95% Adjusted Gamma UCL	22.75	

Potential UCL to Use Use 95% Adjusted Gamma UCL 22.75

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_INDENO123-CDPYR.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_INDENO(1,2,3-CD)PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0037	Minimum of Log Data	-5.599
Maximum	0.87	Maximum of Log Data	-0.139
Mean	0.173	Mean of log Data	-3.508
Median	0.035	SD of log Data	2.126
SD	0.343		
Coefficient of Variation	1.983		
Skewness	2.392		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.583	Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.455	95% H-UCL	674
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.598
95% Adjusted-CLT UCL	0.55	97.5% Chebyshev (MVUE) UCL	0.795
95% Modified-t UCL	0.478	99% Chebyshev (MVUE) UCL	1.183

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.3	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.577	
MLE of Mean	0.173	
MLE of Standard Deviation	0.316	
nu star	3.604	
Approximate Chi Square Value (.05)	0.572	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.404
Adjusted Chi Square Value	0.268	95% Jackknife UCL 0.455
		95% Standard Bootstrap UCL 0.382
Anderson-Darling Test Statistic	0.53	95% Bootstrap-t UCL 2.028
Anderson-Darling 5% Critical Value	0.755	95% Hall's Bootstrap UCL 2.036
Kolmogorov-Smirnov Test Statistic	0.254	95% Percentile Bootstrap UCL 0.446
Kolmogorov-Smirnov 5% Critical Value	0.354	95% BCA Bootstrap UCL 0.466
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.784
		97.5% Chebyshev(Mean, Sd) UCL 1.048
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.567
95% Approximate Gamma UCL	1.091	
95% Adjusted Gamma UCL	2.332	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 2.332

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_IRON

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	3300	Minimum of Log Data	8.102
Maximum	43800	Maximum of Log Data	10.69
Mean	14533	Mean of log Data	9.124
Median	8545	SD of log Data	1.044
SD	15665		
Coefficient of Variation	1.078		
Skewness	1.685		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.793	Shapiro Wilk Test Statistic	0.913
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	27420	95% H-UCL	117012
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	39729
95% Adjusted-CLT UCL	29752	97.5% Chebyshev (MVUE) UCL	50830
95% Modified-t UCL	28153	99% Chebyshev (MVUE) UCL	72635

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.724	**Data appear Normal at 5% Significance Level**
Theta Star	20078	
MLE of Mean	14533	
MLE of Standard Deviation	17082	
nu star	8.686	
Approximate Chi Square Value (.05)	3.138	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 25053
Adjusted Chi Square Value	2.064	95% Jackknife UCL 27420
		95% Standard Bootstrap UCL 24200
Anderson-Darling Test Statistic	0.374	95% Bootstrap-t UCL 46518
Anderson-Darling 5% Critical Value	0.712	95% Hall's Bootstrap UCL 69220
Kolmogorov-Smirnov Test Statistic	0.233	95% Percentile Bootstrap UCL 25298
Kolmogorov-Smirnov 5% Critical Value	0.339	95% BCA Bootstrap UCL 28032
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 42410
		97.5% Chebyshev(Mean, Sd) UCL 54472
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 78166
95% Approximate Gamma UCL	40223	
95% Adjusted Gamma UCL	61172	

Potential UCL to Use	Use 95% Student's-t UCL 27420

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LEAD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	6.8	Minimum of Log Data	1.917
Maximum	121	Maximum of Log Data	4.796
Mean	33.53	Mean of log Data	2.923
Median	13.65	SD of log Data	1.121
SD	44.42		
Coefficient of Variation	1.325		
Skewness	2.106		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.692	Shapiro Wilk Test Statistic	0.876
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	70.07	95% H-UCL	341.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	89.4
95% Adjusted-CLT UCL	80.02	97.5% Chebyshev (MVUE) UCL	115
95% Modified-t UCL	72.67	99% Chebyshev (MVUE) UCL	165.2

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.601	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	55.76	
MLE of Mean	33.53	
MLE of Standard Deviation	43.24	
nu star	7.217	
Approximate Chi Square Value (.05)	2.29	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 63.36
Adjusted Chi Square Value	1.42	95% Jackknife UCL 70.07
		95% Standard Bootstrap UCL 60.9
Anderson-Darling Test Statistic	0.571	95% Bootstrap-t UCL 207.8
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 248.5
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL 64.72
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 74.52
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 112.6
		97.5% Chebyshev(Mean, Sd) UCL 146.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 214
95% Approximate Gamma UCL	105.7	
95% Adjusted Gamma UCL	170.4	

Potential UCL to Use	Use 95% Approximate Gamma UCL 105.7

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_LPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHND0

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0146	Minimum of Log Data	-4.227
Maximum	15.56	Maximum of Log Data	2.745
Mean	2.72	Mean of log Data	-1.853
Median	0.11	SD of log Data	2.634
SD	6.293		
Coefficient of Variation	2.314		
Skewness	2.445		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.897	95% H-UCL	691185
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.665
95% Adjusted-CLT UCL	9.686	97.5% Chebyshev (MVUE) UCL	8.93
95% Modified-t UCL	8.324	99% Chebyshev (MVUE) UCL	13.38

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.236	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	11.54	
MLE of Mean	2.72	
MLE of Standard Deviation	5.603	
nu star	2.828	
Approximate Chi Square Value (.05)	0.323	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.946
Adjusted Chi Square Value	0.145	95% Jackknife UCL 7.897
		95% Standard Bootstrap UCL 6.566
Anderson-Darling Test Statistic	0.774	95% Bootstrap-t UCL 211.6
Anderson-Darling 5% Critical Value	0.785	95% Hall's Bootstrap UCL 111
Kolmogorov-Smirnov Test Statistic	0.325	95% Percentile Bootstrap UCL 7.792
Kolmogorov-Smirnov 5% Critical Value	0.36	95% BCA Bootstrap UCL 7.979
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 13.92
		97.5% Chebyshev(Mean, Sd) UCL 18.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.28
95% Approximate Gamma UCL	23.79	
95% Adjusted Gamma UCL	52.89	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 52.89

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_LPAHND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHND1/2DL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0306	Minimum of Log Data	-3.487
Maximum	15.56	Maximum of Log Data	2.745
Mean	2.734	Mean of log Data	-1.563
Median	0.135	SD of log Data	2.395
SD	6.286		
Coefficient of Variation	2.299		
Skewness	2.445		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.836
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.905	95% H-UCL	66688
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.218
95% Adjusted-CLT UCL	9.692	97.5% Chebyshev (MVUE) UCL	8.308
95% Modified-t UCL	8.332	99% Chebyshev (MVUE) UCL	12.41

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.247	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	11.05	
MLE of Mean	2.734	
MLE of Standard Deviation	5.496	
nu star	2.969	
Approximate Chi Square Value (.05)	0.363	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.955
Adjusted Chi Square Value	0.163	95% Jackknife UCL 7.905
		95% Standard Bootstrap UCL 6.652
Anderson-Darling Test Statistic	0.883	95% Bootstrap-t UCL 175.5
Anderson-Darling 5% Critical Value	0.776	95% Hall's Bootstrap UCL 91.26
Kolmogorov-Smirnov Test Statistic	0.347	95% Percentile Bootstrap UCL 7.828
Kolmogorov-Smirnov 5% Critical Value	0.359	95% BCA Bootstrap UCL 7.956
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 13.92
		97.5% Chebyshev(Mean, Sd) UCL 18.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.27
95% Approximate Gamma UCL	22.34	
95% Adjusted Gamma UCL	49.77	

Potential UCL to Use Use 95% Adjusted Gamma UCL 49.77

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_LPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_LPAHNDDL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0466	Minimum of Log Data	-3.066
Maximum	15.56	Maximum of Log Data	2.745
Mean	2.748	Mean of log Data	-1.377
Median	0.162	SD of log Data	2.257
SD	6.279		
Coefficient of Variation	2.285		
Skewness	2.445		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.52	Shapiro Wilk Test Statistic	0.808
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	7.913	95% H-UCL	19837
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.105
95% Adjusted-CLT UCL	9.698	97.5% Chebyshev (MVUE) UCL	8.141
95% Modified-t UCL	8.34	99% Chebyshev (MVUE) UCL	12.14

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.256	**Data appear Lognormal at 5% Significance Level**
Theta Star	10.72	
MLE of Mean	2.748	
MLE of Standard Deviation	5.428	
nu star	3.075	
Approximate Chi Square Value (.05)	0.395	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.964
Adjusted Chi Square Value	0.178	95% Jackknife UCL 7.913
		95% Standard Bootstrap UCL 6.589
Anderson-Darling Test Statistic	0.943	95% Bootstrap-t UCL 147.2
Anderson-Darling 5% Critical Value	0.77	95% Hall's Bootstrap UCL 91.62
Kolmogorov-Smirnov Test Statistic	0.364	95% Percentile Bootstrap UCL 7.842
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL 10.39
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 13.92
		97.5% Chebyshev(Mean, Sd) UCL 18.76
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 28.25
95% Approximate Gamma UCL	21.39	
95% Adjusted Gamma UCL	47.54	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 28.25

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_MERCURY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_MERCURY

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.014	Minimum Detected	-4.269
Maximum Detected	0.39	Maximum Detected	-0.942
Mean of Detected	0.122	Mean of Detected	-2.789
SD of Detected	0.156	SD of Detected	1.342
Minimum Non-Detect	0.032	Minimum Non-Detect	-3.442
Maximum Non-Detect	0.032	Maximum Non-Detect	-3.442

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.772	Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.104	Mean	-3.013
SD	0.146	SD	1.32
95% DL/2 (t) UCL	0.224	95% H-Stat (DL/2) UCL	4.266
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0237	Mean in Log Scale	-3.001
SD	0.217	SD in Log Scale	1.309
95% MLE (t) UCL	0.202	Mean in Original Scale	0.104
95% MLE (Tiku) UCL	0.244	SD in Original Scale	0.146
		95% Percentile Bootstrap UCL	0.204
		95% BCA Bootstrap UCL	0.246

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.478	**Data appear Normal at 5% Significance Level**	
Theta Star	0.255		
nu star	4.776		
A-D Test Statistic	0.291	**Nonparametric Statistics**	
5% A-D Critical Value	0.695	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.695	Mean	0.104
5% K-S Critical Value	0.366	SD	0.133
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0607
		95% KM (t) UCL	0.227
Assuming Gamma Distribution		95% KM (z) UCL	0.204
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.224
Minimum	0.014	95% KM (bootstrap t) UCL	0.539
Maximum	0.39	95% KM (BCA) UCL	0.21
Mean	0.105	95% KM (Percentile Bootstrap) UCL	0.21
Median	0.0425	95% KM (Chebyshev) UCL	0.369
SD	0.145	97.5% KM (Chebyshev) UCL	0.484
k star	0.521	99% KM (Chebyshev) UCL	0.708
Theta star	0.201		
Nu star	6.253	**Potential UCLs to Use**	
AppChi2	1.771	95% KM (t) UCL	0.227
95% Gamma Approximate UCL	0.37	95% KM (Percentile Bootstrap) UCL	0.21
95% Adjusted Gamma UCL	0.629		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NAPHTHALENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0049	Minimum of Log Data	-5.319
Maximum	8.3	Maximum of Log Data	2.116
Mean	1.407	Mean of log Data	-3.1
Median	0.0223	SD of log Data	2.767
SD	3.377		
Coefficient of Variation	2.401		
Skewness	2.449		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.504	Shapiro Wilk Test Statistic	0.813
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.185	95% H-UCL	952167
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.344
95% Adjusted-CLT UCL	5.147	97.5% Chebyshev (MVUE) UCL	3.144
95% Modified-t UCL	4.415	99% Chebyshev (MVUE) UCL	4.715

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.217	**Data appear Lognormal at 5% Significance Level**
Theta Star	6.481	
MLE of Mean	1.407	
MLE of Standard Deviation	3.019	
nu star	2.605	
Approximate Chi Square Value (.05)	0.266	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 3.675
Adjusted Chi Square Value	0.122	95% Jackknife UCL 4.185
		95% Standard Bootstrap UCL 3.458
Anderson-Darling Test Statistic	1.036	95% Bootstrap-t UCL 342.7
Anderson-Darling 5% Critical Value	0.798	95% Hall's Bootstrap UCL 172.2
Kolmogorov-Smirnov Test Statistic	0.401	95% Percentile Bootstrap UCL 4.155
Kolmogorov-Smirnov 5% Critical Value	0.363	95% BCA Bootstrap UCL 5.535
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.416
		97.5% Chebyshev(Mean, Sd) UCL 10.02
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.12
95% Approximate Gamma UCL	13.79	
95% Adjusted Gamma UCL	30.03	

Potential UCL to Use	Use 99% Chebyshev (Mean, Sd) UCL 15.12

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_NICKEL

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	2.5	Minimum of Log Data	0.916
Maximum	37.4	Maximum of Log Data	3.622
Mean	13.17	Mean of log Data	2.096
Median	7.2	SD of log Data	1.086
SD	13.8		
Coefficient of Variation	1.048		
Skewness	1.357		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.923
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	24.52	95% H-UCL	126
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37.29
95% Adjusted-CLT UCL	25.76	97.5% Chebyshev (MVUE) UCL	47.84
95% Modified-t UCL	25.04	99% Chebyshev (MVUE) UCL	68.56

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.7	**Data appear Normal at 5% Significance Level**
Theta Star	18.81	
MLE of Mean	13.17	
MLE of Standard Deviation	15.74	
nu star	8.398	
Approximate Chi Square Value (.05)	2.967	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 22.43
Adjusted Chi Square Value	1.932	95% Jackknife UCL 24.52
		95% Standard Bootstrap UCL 21.63
Anderson-Darling Test Statistic	0.375	95% Bootstrap-t UCL 42.87
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL 69.32
Kolmogorov-Smirnov Test Statistic	0.262	95% Percentile Bootstrap UCL 22.52
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL 23.68
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 37.72
		97.5% Chebyshev(Mean, Sd) UCL 48.34
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 69.21
95% Approximate Gamma UCL	37.26	
95% Adjusted Gamma UCL	57.24	

Potential UCL to Use		
		Use 95% Student's-t UCL 24.52

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_OCDD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.00026	Minimum of Log Data	-8.255
Maximum	0.011	Maximum of Log Data	-4.51
Mean	0.0026	Mean of log Data	-6.862
Median	0.000665	SD of log Data	1.389
SD	0.0042		
Coefficient of Variation	1.618		
Skewness	2.242		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.641	Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.00606	95% H-UCL	0.0825
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.00727
95% Adjusted-CLT UCL	0.0071	97.5% Chebyshev (MVUE) UCL	0.00948
95% Modified-t UCL	0.00632	99% Chebyshev (MVUE) UCL	0.0138

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.446	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.00583	
MLE of Mean	0.0026	
MLE of Standard Deviation	0.00389	
nu star	5.346	
Approximate Chi Square Value (.05)	1.315	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.00542
Adjusted Chi Square Value	0.727	95% Jackknife UCL 0.00606
		95% Standard Bootstrap UCL 0.00516
Anderson-Darling Test Statistic	0.628	95% Bootstrap-t UCL 0.0517
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL 0.0307
Kolmogorov-Smirnov Test Statistic	0.342	95% Percentile Bootstrap UCL 0.00573
Kolmogorov-Smirnov 5% Critical Value	0.345	95% BCA Bootstrap UCL 0.00647
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0101
		97.5% Chebyshev(Mean, Sd) UCL 0.0133
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0197
95% Approximate Gamma UCL	0.0106	
95% Adjusted Gamma UCL	0.0191	

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.0106

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_OCDF.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_OCDF

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0000029	Minimum of Log Data	-12.75
Maximum	0.000086	Maximum of Log Data	-9.361
Mean	2.283E-05	Mean of log Data	-11.28
Median	0.0000114	SD of log Data	1.132
SD	3.139E-05		
Coefficient of Variation	N/A		
Skewness	2.297		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.657	Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4.866E-05	95% H-UCL	0.0002449
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.162E-05
95% Adjusted-CLT UCL	5.675E-05	97.5% Chebyshev (MVUE) UCL	7.928E-05
95% Modified-t UCL	5.066E-05	99% Chebyshev (MVUE) UCL	0.000114

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.599	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	3.811E-05	
MLE of Mean	2.283E-05	
MLE of Standard Deviation	2.95E-05	
nu star	7.19	
Approximate Chi Square Value (.05)	2.275	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 4.391E-05
Adjusted Chi Square Value	1.409	95% Jackknife UCL 4.866E-05
		95% Standard Bootstrap UCL 4.252E-05
Anderson-Darling Test Statistic	0.497	95% Bootstrap-t UCL 0.0001371
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 0.000146
Kolmogorov-Smirnov Test Statistic	0.285	95% Percentile Bootstrap UCL 4.642E-05
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 5.133E-05
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.869E-05
		97.5% Chebyshev(Mean, Sd) UCL 0.0001029
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0001503
95% Approximate Gamma UCL	7.215E-05	
95% Adjusted Gamma UCL	0.0001165	

Potential UCL to Use	Use 95% Approximate Gamma UCL 7.215E-05

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 18 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 18 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.00016	Minimum Detected	-8.74
Maximum Detected	0.0027	Maximum Detected	-5.915
Mean of Detected	0.000748	Mean of Detected	-7.85
SD of Detected	0.0011	SD of Detected	1.148
Minimum Non-Detect	0.00023	Minimum Non-Detect	-8.377
Maximum Non-Detect	0.00023	Maximum Non-Detect	-8.377

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.633	Shapiro Wilk Test Statistic	0.807
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0006425	Mean	-8.054
SD	0.00101	SD	1.141
95% DL/2 (t) UCL	0.00148	95% H-Stat (DL/2) UCL	0.00801
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-7.955
		SD in Log Scale	1.058
		Mean in Original Scale	0.0006579
		SD in Original Scale	0.00101
		95% Percentile Bootstrap UCL	0.00145
		95% BCA Bootstrap UCL	0.00153

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**
k star (bias corrected)	0.492	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	0.00152	
nu star	4.921	
A-D Test Statistic	0.763	**Nonparametric Statistics**
5% A-D Critical Value	0.694	Kaplan-Meier (KM) Method
K-S Test Statistic	0.694	Mean 0.0006561
5% K-S Critical Value	0.365	SD 0.000919
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean 0.0004195
		95% KM (t) UCL 0.0015
Assuming Gamma Distribution		95% KM (z) UCL 0.00135
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.00148
Minimum	0.00016	95% KM (bootstrap t) UCL 0.0153
Maximum	0.0027	95% KM (BCA) UCL 0.00146
Mean	0.0006654	95% KM (Percentile Bootstrap) UCL 0.00145
Median	0.0002363	95% KM (Chebyshev) UCL 0.00248
SD	0.001	97.5% KM (Chebyshev) UCL 0.00328
k star	0.589	99% KM (Chebyshev) UCL 0.00483
Theta star	0.00113	
Nu star	7.066	**Potential UCLs to Use**
AppChi2	2.207	95% KM (Chebyshev) UCL 0.00248
95% Gamma Approximate UCL	0.00213	
95% Adjusted Gamma UCL	0.00346	

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 28 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 28 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00024	Minimum Detected	-8.335
Maximum Detected	0.0073	Maximum Detected	-4.92
Mean of Detected	0.00188	Mean of Detected	-7.181
SD of Detected	0.00305	SD of Detected	1.405
Minimum Non-Detect	0.00022	Minimum Non-Detect	-8.422
Maximum Non-Detect	0.00022	Maximum Non-Detect	-8.422

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.644	Shapiro Wilk Test Statistic	0.868
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00159	Mean	-7.503
SD	0.00282	SD	1.484
95% DL/2 (t) UCL	0.00391	95% H-Stat (DL/2) UCL	0.079
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.00128	Mean in Log Scale	-7.766
SD	0.00291	SD in Log Scale	1.907
95% MLE (t) UCL	0.00367	Mean in Original Scale	0.00157
95% MLE (Tiku) UCL	0.00358	SD in Original Scale	0.00283
		95% Percentile Bootstrap UCL	0.00378
		95% BCA Bootstrap UCL	0.00406

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.402	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.00468		
nu star	4.02		
A-D Test Statistic	0.605	**Nonparametric Statistics**	
5% A-D Critical Value	0.702	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.702	Mean	0.00161
5% K-S Critical Value	0.368	SD	0.00256
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00117
		95% KM (t) UCL	0.00397
Assuming Gamma Distribution		95% KM (z) UCL	0.00353
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00392
Minimum	1E-09	95% KM (bootstrap t) UCL	0.0281
Maximum	0.0073	95% KM (BCA) UCL	0.00386
Mean	0.00157	95% KM (Percentile Bootstrap) UCL	0.00382
Median	0.000385	95% KM (Chebyshev) UCL	0.00671
SD	0.00283	97.5% KM (Chebyshev) UCL	0.00891
k star	0.231	99% KM (Chebyshev) UCL	0.0132
Theta star	0.00679		
Nu star	2.773	**Potential UCLs to Use**	
AppChi2	0.308	95% KM (Chebyshev) UCL	0.00671
95% Gamma Approximate UCL	0.0141		
95% Adjusted Gamma UCL	0.0312		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 49 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 49 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.000085	Minimum Detected	-9.373
Maximum Detected	0.0048	Maximum Detected	-5.339
Mean of Detected	0.00124	Mean of Detected	-7.785
SD of Detected	0.00201	SD of Detected	1.674
Minimum Non-Detect	0.00022	Minimum Non-Detect	-8.422
Maximum Non-Detect	0.00022	Maximum Non-Detect	-8.422

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.676	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00105	Mean	-8.007
SD	0.00186	SD	1.593
95% DL/2 (t) UCL	0.00258	95% H-Stat (DL/2) UCL	0.176
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-8.043
		SD in Log Scale	1.626
		Mean in Original Scale	0.00105
		SD in Original Scale	0.00186
		95% Percentile Bootstrap UCL	0.0025
		95% BCA Bootstrap UCL	0.00323

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.361	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.00343		
nu star	3.614		
A-D Test Statistic	0.427	**Nonparametric Statistics**	
5% A-D Critical Value	0.707	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.707	Mean	0.00105
5% K-S Critical Value	0.37	SD	0.0017
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0007752
		95% KM (t) UCL	0.00261
Assuming Gamma Distribution		95% KM (z) UCL	0.00232
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00258
Minimum	1E-09	95% KM (bootstrap t) UCL	0.0109
Maximum	0.0048	95% KM (BCA) UCL	0.0025
Mean	0.00103	95% KM (Percentile Bootstrap) UCL	0.0025
Median	0.0002465	95% KM (Chebyshev) UCL	0.00443
SD	0.00187	97.5% KM (Chebyshev) UCL	0.00589
k star	0.228	99% KM (Chebyshev) UCL	0.00876
Theta star	0.00453		
Nu star	2.738	**Potential UCLs to Use**	
AppChi2	0.299	95% KM (Chebyshev) UCL	0.00443
95% Gamma Approximate UCL	0.00945		
95% Adjusted Gamma UCL	0.0209		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 52 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 52 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00011	Minimum Detected	-9.115
Maximum Detected	0.0058	Maximum Detected	-5.15
Mean of Detected	0.0018	Mean of Detected	-7.275
SD of Detected	0.00269	SD of Detected	1.657
Minimum Non-Detect	0.00021	Minimum Non-Detect	-8.468
Maximum Non-Detect	0.00022	Maximum Non-Detect	-8.422

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.735	Shapiro Wilk Test Statistic	0.988
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00124	Mean	-7.896
SD	0.00226	SD	1.604
95% DL/2 (t) UCL	0.00309	95% H-Stat (DL/2) UCL	0.182
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-7.987
		SD in Log Scale	1.692
		Mean in Original Scale	0.00123
		SD in Original Scale	0.00226
		95% Percentile Bootstrap UCL	0.00295
		95% BCA Bootstrap UCL	0.00389

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.327	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.00551		
nu star	2.615		
A-D Test Statistic	0.327	**Nonparametric Statistics**	
5% A-D Critical Value	0.675	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.675	Mean	0.00124
5% K-S Critical Value	0.407	SD	0.00206
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0009707
		95% KM (t) UCL	0.00319
Assuming Gamma Distribution		95% KM (z) UCL	0.00283
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00305
Minimum	0.00011	95% KM (bootstrap t) UCL	0.0103
Maximum	0.0058	95% KM (BCA) UCL	0.00326
Mean	0.00136	95% KM (Percentile Bootstrap) UCL	0.00311
Median	0.0004667	95% KM (Chebyshev) UCL	0.00547
SD	0.00219	97.5% KM (Chebyshev) UCL	0.0073
k star	0.484	99% KM (Chebyshev) UCL	0.0109
Theta star	0.0028		
Nu star	5.809	**Potential UCLs to Use**	
AppChi2	1.543	95% KM (BCA) UCL	0.00326
95% Gamma Approximate UCL	0.0051		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 206 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 206 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.000082	Minimum Detected	-9.409
Maximum Detected	0.0023	Maximum Detected	-6.075
Mean of Detected	0.00105	Mean of Detected	-7.432
SD of Detected	0.0009772	SD of Detected	1.46
Minimum Non-Detect	0.00021	Minimum Non-Detect	-8.468
Maximum Non-Detect	0.00022	Maximum Non-Detect	-8.422

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk Test Statistic	0.939
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0007328	Mean	-8.001
SD	0.0008986	SD	1.434
95% DL/2 (t) UCL	0.00147	95% H-Stat (DL/2) UCL	0.0633
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0002656	Mean in Log Scale	-8.085
SD	0.00134	SD in Log Scale	1.517
95% MLE (t) UCL	0.00137	Mean in Original Scale	0.0007249
95% MLE (Tiku) UCL	0.00163	SD in Original Scale	0.0009053
		95% Percentile Bootstrap UCL	0.0013
		95% BCA Bootstrap UCL	0.00143

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.42	**Data appear Normal at 5% Significance Level**	
Theta Star	0.00249		
nu star	3.358		
A-D Test Statistic	0.223	**Nonparametric Statistics**	
5% A-D Critical Value	0.667	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.667	Mean	0.0007243
5% K-S Critical Value	0.402	SD	0.0008269
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0003898
		95% KM (t) UCL	0.00151
Assuming Gamma Distribution		95% KM (z) UCL	0.00137
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00147
Minimum	0.000082	95% KM (bootstrap t) UCL	0.00152
Maximum	0.0023	95% KM (BCA) UCL	0.00163
Mean	0.0009061	95% KM (Percentile Bootstrap) UCL	0.00163
Median	0.0006273	95% KM (Chebyshev) UCL	0.00242
SD	0.0007871	97.5% KM (Chebyshev) UCL	0.00316
k star	0.797	99% KM (Chebyshev) UCL	0.0046
Theta star	0.00114		
Nu star	9.567	**Potential UCLs to Use**	
AppChi2	3.673	95% KM (t) UCL	0.00151
95% Gamma Approximate UCL	0.00236	95% KM (Percentile Bootstrap) UCL	0.00163
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PCB 209 BZ.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PCB 209 (BZ)

General Statistics

Number of Valid Data	6	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
		Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00012	Minimum Detected	-9.028
Maximum Detected	0.0041	Maximum Detected	-5.497
Mean of Detected	0.00198	Mean of Detected	-6.837
SD of Detected	0.00177	SD of Detected	1.576
Minimum Non-Detect	0.00021	Minimum Non-Detect	-8.468
Maximum Non-Detect	0.00022	Maximum Non-Detect	-8.422

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk Test Statistic	0.902
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00136	Mean	-7.604
SD	0.00168	SD	1.704
95% DL/2 (t) UCL	0.00274	95% H-Stat (DL/2) UCL	0.476
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0003976	Mean in Log Scale	-7.537
SD	0.00262	SD in Log Scale	1.633
95% MLE (t) UCL	0.00255	Mean in Original Scale	0.00136
95% MLE (Tiku) UCL	0.00305	SD in Original Scale	0.00167
		95% Percentile Bootstrap UCL	0.00246
		95% BCA Bootstrap UCL	0.00254

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.404	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0049		
nu star	3.231		
A-D Test Statistic	0.272	**Nonparametric Statistics**	
5% A-D Critical Value	0.667	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.667	Mean	0.00136
5% K-S Critical Value	0.403	SD	0.00153
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0007213
		95% KM (t) UCL	0.00281
Assuming Gamma Distribution		95% KM (z) UCL	0.00255
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00275
Minimum	0.00012	95% KM (bootstrap t) UCL	0.00265
Maximum	0.0041	95% KM (BCA) UCL	0.00317
Mean	0.00174	95% KM (Percentile Bootstrap) UCL	0.00307
Median	0.00127	95% KM (Chebyshev) UCL	0.0045
SD	0.00142	97.5% KM (Chebyshev) UCL	0.00586
k star	0.765	99% KM (Chebyshev) UCL	0.00854
Theta star	0.00228		
Nu star	9.183	**Potential UCLs to Use**	
AppChi2	3.438	95% KM (t) UCL	0.00281
95% Gamma Approximate UCL	0.00466	95% KM (Percentile Bootstrap) UCL	0.00307
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PHENANTHRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0034	Minimum of Log Data	-5.684
Maximum	2	Maximum of Log Data	0.693
Mean	0.358	Mean of log Data	-3.54
Median	0.0212	SD of log Data	2.47
SD	0.805		
Coefficient of Variation	2.247		
Skewness	2.438		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.532	Shapiro Wilk Test Statistic	0.876
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1.021	95% H-UCL	20631
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.964
95% Adjusted-CLT UCL	1.248	97.5% Chebyshev (MVUE) UCL	1.289
95% Modified-t UCL	1.075	99% Chebyshev (MVUE) UCL	1.928

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.25	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	1.433	
MLE of Mean	0.358	
MLE of Standard Deviation	0.717	
nu star	3	
Approximate Chi Square Value (.05)	0.372	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.899
Adjusted Chi Square Value	0.167	95% Jackknife UCL 1.021
		95% Standard Bootstrap UCL 0.852
Anderson-Darling Test Statistic	0.734	95% Bootstrap-t UCL 21.54
Anderson-Darling 5% Critical Value	0.775	95% Hall's Bootstrap UCL 11.35
Kolmogorov-Smirnov Test Statistic	0.297	95% Percentile Bootstrap UCL 1.007
Kolmogorov-Smirnov 5% Critical Value	0.358	95% BCA Bootstrap UCL 1.335
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.791
		97.5% Chebyshev(Mean, Sd) UCL 2.411
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.629
95% Approximate Gamma UCL	2.886	
95% Adjusted Gamma UCL	6.427	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 6.427

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_PYRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_PYRENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0051	Minimum of Log Data	-5.279
Maximum	1.4	Maximum of Log Data	0.336
Mean	0.263	Mean of log Data	-3.276
Median	0.029	SD of log Data	2.126
SD	0.558		
Coefficient of Variation	2.121		
Skewness	2.422		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.554	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.722	95% H-UCL	849.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.754
95% Adjusted-CLT UCL	0.879	97.5% Chebyshev (MVUE) UCL	1.003
95% Modified-t UCL	0.76	99% Chebyshev (MVUE) UCL	1.492

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.285	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.925	
MLE of Mean	0.263	
MLE of Standard Deviation	0.493	
nu star	3.415	
Approximate Chi Square Value (.05)	0.505	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.638
Adjusted Chi Square Value	0.232	95% Jackknife UCL 0.722
		95% Standard Bootstrap UCL 0.602
Anderson-Darling Test Statistic	0.652	95% Bootstrap-t UCL 7.738
Anderson-Darling 5% Critical Value	0.759	95% Hall's Bootstrap UCL 4.706
Kolmogorov-Smirnov Test Statistic	0.28	95% Percentile Bootstrap UCL 0.709
Kolmogorov-Smirnov 5% Critical Value	0.355	95% BCA Bootstrap UCL 0.744
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.257
		97.5% Chebyshev(Mean, Sd) UCL 1.687
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.531
95% Approximate Gamma UCL	1.779	
95% Adjusted Gamma UCL	3.868	

Potential UCL to Use Use 95% Adjusted Gamma UCL 3.868

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_SILVER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_SILVER

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.038	Minimum of Log Data	-3.27
Maximum	0.94	Maximum of Log Data	-0.0619
Mean	0.27	Mean of log Data	-1.912
Median	0.125	SD of log Data	1.175
SD	0.345		
Coefficient of Variation	1.279		
Skewness	2.002		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.734	Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.553	95% H-UCL	3.559
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.766
95% Adjusted-CLT UCL	0.624	97.5% Chebyshev (MVUE) UCL	0.988
95% Modified-t UCL	0.572	99% Chebyshev (MVUE) UCL	1.424

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.594	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.454	
MLE of Mean	0.27	
MLE of Standard Deviation	0.35	
nu star	7.124	
Approximate Chi Square Value (.05)	2.239	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.501
Adjusted Chi Square Value	1.382	95% Jackknife UCL 0.553
		95% Standard Bootstrap UCL 0.482
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL 1.644
Anderson-Darling 5% Critical Value	0.716	95% Hall's Bootstrap UCL 1.587
Kolmogorov-Smirnov Test Statistic	0.234	95% Percentile Bootstrap UCL 0.518
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 0.586
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.883
		97.5% Chebyshev(Mean, Sd) UCL 1.148
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.67
95% Approximate Gamma UCL	0.858	
95% Adjusted Gamma UCL	1.389	

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.858

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PAH ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PAH (ND=0)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.046	Minimum of Log Data	-3.079
Maximum	24.12	Maximum of Log Data	3.183
Mean	4.333	Mean of log Data	-0.903
Median	0.318	SD of log Data	2.365
SD	9.703		
Coefficient of Variation	2.239		
Skewness	2.439		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.532	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12.31	95% H-UCL	94885
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11.51
95% Adjusted-CLT UCL	15.06	97.5% Chebyshev (MVUE) UCL	15.37
95% Modified-t UCL	12.97	99% Chebyshev (MVUE) UCL	22.96

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.257	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	16.85	
MLE of Mean	4.333	
MLE of Standard Deviation	8.544	
nu star	3.087	
Approximate Chi Square Value (.05)	0.399	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 10.85
Adjusted Chi Square Value	0.179	95% Jackknife UCL 12.31
		95% Standard Bootstrap UCL 10.26
Anderson-Darling Test Statistic	0.722	95% Bootstrap-t UCL 187
Anderson-Darling 5% Critical Value	0.769	95% Hall's Bootstrap UCL 95.5
Kolmogorov-Smirnov Test Statistic	0.316	95% Percentile Bootstrap UCL 12.16
Kolmogorov-Smirnov 5% Critical Value	0.357	95% BCA Bootstrap UCL 16.11
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 21.6
		97.5% Chebyshev(Mean, Sd) UCL 29.07
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 43.75
95% Approximate Gamma UCL	33.56	
95% Adjusted Gamma UCL	74.55	

Potential UCL to Use Use 95% Adjusted Gamma UCL 74.55

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PAH ND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PAH (ND=1/2DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.0684	Minimum of Log Data	-2.682
Maximum	24.18	Maximum of Log Data	3.185
Mean	4.358	Mean of log Data	-0.755
Median	0.343	SD of log Data	2.231
SD	9.717		
Coefficient of Variation	2.229		
Skewness	2.44		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.531	Shapiro Wilk Test Statistic	0.87
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.35	95% H-UCL	28807
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.95
95% Adjusted-CLT UCL	15.1	97.5% Chebyshev (MVUE) UCL	14.6
95% Modified-t UCL	13.01	99% Chebyshev (MVUE) UCL	21.77

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.265	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	16.43	
MLE of Mean	4.358	
MLE of Standard Deviation	8.462	
nu star	3.183	
Approximate Chi Square Value (.05)	0.429	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 10.88
Adjusted Chi Square Value	0.194	95% Jackknife UCL 12.35
		95% Standard Bootstrap UCL 10.31
Anderson-Darling Test Statistic	0.788	95% Bootstrap-t UCL 180.5
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL 123.1
Kolmogorov-Smirnov Test Statistic	0.329	95% Percentile Bootstrap UCL 12.2
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 12.49
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 21.65
		97.5% Chebyshev(Mean, Sd) UCL 29.13
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 43.83
95% Approximate Gamma UCL	32.36	
95% Adjusted Gamma UCL	71.57	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 71.57

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PAH NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PAH (ND=DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.0908	Minimum of Log Data	-2.399
Maximum	24.23	Maximum of Log Data	3.188
Mean	4.384	Mean of log Data	-0.643
Median	0.368	SD of log Data	2.138
SD	9.731		
Coefficient of Variation	2.22		
Skewness	2.44		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.531	Shapiro Wilk Test Statistic	0.847
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12.39	95% H-UCL	13250
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.68
95% Adjusted-CLT UCL	15.15	97.5% Chebyshev (MVUE) UCL	14.22
95% Modified-t UCL	13.05	99% Chebyshev (MVUE) UCL	21.17

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	0.272	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	16.12	
MLE of Mean	4.384	
MLE of Standard Deviation	8.407	
nu star	3.263	
Approximate Chi Square Value (.05)	0.454	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 10.92
Adjusted Chi Square Value	0.206	95% Jackknife UCL 12.39
		95% Standard Bootstrap UCL 10.3
Anderson-Darling Test Statistic	0.84	95% Bootstrap-t UCL 203
Anderson-Darling 5% Critical Value	0.763	95% Hall's Bootstrap UCL 103.6
Kolmogorov-Smirnov Test Statistic	0.339	95% Percentile Bootstrap UCL 12.25
Kolmogorov-Smirnov 5% Critical Value	0.356	95% BCA Bootstrap UCL 16.19
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 21.7
		97.5% Chebyshev(Mean, Sd) UCL 29.19
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 43.91
95% Approximate Gamma UCL	31.48	
95% Adjusted Gamma UCL	69.27	

Potential UCL to Use	Use 95% Adjusted Gamma UCL 69.27

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PCBS ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PCBs (ND=0)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.000884	Minimum of Log Data	-7.031
Maximum	0.0434	Maximum of Log Data	-3.137
Mean	0.01	Mean of log Data	-5.47
Median	0.00356	SD of log Data	1.345
SD	0.0165		
Coefficient of Variation	1.65		
Skewness	2.364		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.611	Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.0236	95% H-UCL	0.256
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0275
95% Adjusted-CLT UCL	0.028	97.5% Chebyshev (MVUE) UCL	0.0358
95% Modified-t UCL	0.0246	99% Chebyshev (MVUE) UCL	0.0521

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.461	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.0217	
MLE of Mean	0.01	
MLE of Standard Deviation	0.0147	
nu star	5.53	
Approximate Chi Square Value (.05)	1.405	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0211
Adjusted Chi Square Value	0.788	95% Jackknife UCL 0.0236
		95% Standard Bootstrap UCL 0.0201
Anderson-Darling Test Statistic	0.594	95% Bootstrap-t UCL 0.111
Anderson-Darling 5% Critical Value	0.724	95% Hall's Bootstrap UCL 0.0868
Kolmogorov-Smirnov Test Statistic	0.285	95% Percentile Bootstrap UCL 0.0229
Kolmogorov-Smirnov 5% Critical Value	0.344	95% BCA Bootstrap UCL 0.0243
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0394
		97.5% Chebyshev(Mean, Sd) UCL 0.0521
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.077
95% Approximate Gamma UCL	0.0394	
95% Adjusted Gamma UCL	0.0702	

Potential UCL to Use	Use 95% Approximate Gamma UCL 0.0394

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PCBS ND12D.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PCBs (ND=1/2DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.00396	Minimum of Log Data	-5.531
Maximum	0.0508	Maximum of Log Data	-2.979
Mean	0.0135	Mean of log Data	-4.807
Median	0.00582	SD of log Data	0.954
SD	0.0184		
Coefficient of Variation	1.368		
Skewness	2.375		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.596	Shapiro Wilk Test Statistic	0.785
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.0286	95% H-UCL	0.0696
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0313
95% Adjusted-CLT UCL	0.0337	97.5% Chebyshev (MVUE) UCL	0.0398
95% Modified-t UCL	0.0299	99% Chebyshev (MVUE) UCL	0.0565

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.679	**Data Follow Appr. Gamma Distribution at 5% Significance Level**
Theta Star	0.0198	
MLE of Mean	0.0135	
MLE of Standard Deviation	0.0164	
nu star	8.153	
Approximate Chi Square Value (.05)	2.824	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0259
Adjusted Chi Square Value	1.822	95% Jackknife UCL 0.0286
		95% Standard Bootstrap UCL 0.0247
Anderson-Darling Test Statistic	0.913	95% Bootstrap-t UCL 0.176
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL 0.104
Kolmogorov-Smirnov Test Statistic	0.325	95% Percentile Bootstrap UCL 0.0278
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL 0.0298
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0463
		97.5% Chebyshev(Mean, Sd) UCL 0.0605
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0884
95% Approximate Gamma UCL	0.0389	
95% Adjusted Gamma UCL	0.0603	

Potential UCL to Use		
		Use 95% Approximate Gamma UCL 0.0389

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_TOTAL PCBS NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_TOTAL PCBs (ND=DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	0.00696	Minimum of Log Data	-4.968
Maximum	0.0583	Maximum of Log Data	-2.842
Mean	0.017	Mean of log Data	-4.455
Median	0.00816	SD of log Data	0.827
SD	0.0204		
Coefficient of Variation	1.202		
Skewness	2.378		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.586	Shapiro Wilk Test Statistic	0.715
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.0337	95% H-UCL	0.061
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.0376
95% Adjusted-CLT UCL	0.0393	97.5% Chebyshev (MVUE) UCL	0.0473
95% Modified-t UCL	0.0351	99% Chebyshev (MVUE) UCL	0.0662

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.845	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	0.0201	
MLE of Mean	0.017	
MLE of Standard Deviation	0.0185	
nu star	10.13	
Approximate Chi Square Value (.05)	4.026	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 0.0306
Adjusted Chi Square Value	2.763	95% Jackknife UCL 0.0337
		95% Standard Bootstrap UCL 0.0297
Anderson-Darling Test Statistic	1.055	95% Bootstrap-t UCL 0.188
Anderson-Darling 5% Critical Value	0.708	95% Hall's Bootstrap UCL 0.109
Kolmogorov-Smirnov Test Statistic	0.339	95% Percentile Bootstrap UCL 0.0327
Kolmogorov-Smirnov 5% Critical Value	0.338	95% BCA Bootstrap UCL 0.0357
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.0532
		97.5% Chebyshev(Mean, Sd) UCL 0.0689
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.0998
95% Approximate Gamma UCL	0.0427	
95% Adjusted Gamma UCL	0.0622	

Potential UCL to Use		
		Use 95% Chebyshev (Mean, Sd) UCL 0.0532

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_WHO TEQ ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=0)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	2.19E-09	Minimum of Log Data	-19.94
Maximum	9.72E-06	Maximum of Log Data	-11.54
Mean	2.295E-06	Mean of log Data	-15.68
Median	4.054E-07	SD of log Data	3.564
SD	3.843E-06		
Coefficient of Variation	N/A		
Skewness	1.964		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.704	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.456E-06	95% H-UCL	198633
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.773E-05
95% Adjusted-CLT UCL	6.22E-06	97.5% Chebyshev (MVUE) UCL	3.737E-05
95% Modified-t UCL	5.666E-06	99% Chebyshev (MVUE) UCL	5.63E-05

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.242	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	9.488E-06	
MLE of Mean	2.295E-06	
MLE of Standard Deviation	4.666E-06	
nu star	2.903	
Approximate Chi Square Value (.05)	0.344	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 4.876E-06
Adjusted Chi Square Value	0.155	95% Jackknife UCL 5.456E-06
		95% Standard Bootstrap UCL 4.617E-06
Anderson-Darling Test Statistic	0.271	95% Bootstrap-t UCL 2.614E-05
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL 2.091E-05
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL 4.996E-06
Kolmogorov-Smirnov 5% Critical Value	0.359	95% BCA Bootstrap UCL 5.938E-06
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 9.134E-06
		97.5% Chebyshev(Mean, Sd) UCL 1.209E-05
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.791E-05
95% Approximate Gamma UCL	1.936E-05	
95% Adjusted Gamma UCL	4.311E-05	

Potential UCL to Use	Use 95% Adjusted Gamma UCL	4.311E-05

Recommended UCL exceeds the maximum observation

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_WHO TEQ ND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=1/2DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	3.934E-07	Minimum of Log Data	-14.75
Maximum	1.062E-05	Maximum of Log Data	-11.45
Mean	3.359E-06	Mean of log Data	-13.37
Median	2.129E-06	SD of log Data	1.446
SD	3.992E-06		
Coefficient of Variation	N/A		
Skewness	1.46		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.803	Shapiro Wilk Test Statistic	0.841
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6.643E-06	95% H-UCL	0.0001764
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.181E-05
95% Adjusted-CLT UCL	7.078E-06	97.5% Chebyshev (MVUE) UCL	1.543E-05
95% Modified-t UCL	6.805E-06	99% Chebyshev (MVUE) UCL	2.254E-05

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.502	**Data appear Normal at 5% Significance Level**
Theta Star	6.695E-06	
MLE of Mean	3.359E-06	
MLE of Standard Deviation	4.742E-06	
nu star	6.02	
Approximate Chi Square Value (.05)	1.65	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 6.04E-06
Adjusted Chi Square Value	0.957	95% Jackknife UCL 6.643E-06
		95% Standard Bootstrap UCL 5.796E-06
Anderson-Darling Test Statistic	0.52	95% Bootstrap-t UCL 8.808E-06
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 1.517E-05
Kolmogorov-Smirnov Test Statistic	0.302	95% Percentile Bootstrap UCL 6.085E-06
Kolmogorov-Smirnov 5% Critical Value	0.343	95% BCA Bootstrap UCL 6.744E-06
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.046E-05
		97.5% Chebyshev(Mean, Sd) UCL 1.354E-05
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.957E-05
95% Approximate Gamma UCL	1.225E-05	
95% Adjusted Gamma UCL	2.112E-05	

Potential UCL to Use	Use 95% Student's-t UCL 6.643E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_WHO TEQ NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_WHO TEQ (ND=DL)

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	7.841E-07	Minimum of Log Data	-14.06
Maximum	1.152E-05	Maximum of Log Data	-11.37
Mean	4.423E-06	Mean of log Data	-12.9
Median	2.587E-06	SD of log Data	1.234
SD	4.55E-06		
Coefficient of Variation	N/A		
Skewness	0.879		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.832	Shapiro Wilk Test Statistic	0.829
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	8.166E-06	95% H-UCL	8.134E-05
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.399E-05
95% Adjusted-CLT UCL	8.191E-06	97.5% Chebyshev (MVUE) UCL	1.81E-05
95% Modified-t UCL	8.277E-06	99% Chebyshev (MVUE) UCL	2.619E-05

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.614	**Data appear Normal at 5% Significance Level**
Theta Star	7.204E-06	
MLE of Mean	4.423E-06	
MLE of Standard Deviation	5.645E-06	
nu star	7.368	
Approximate Chi Square Value (.05)	2.375	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 7.479E-06
Adjusted Chi Square Value	1.483	95% Jackknife UCL 8.166E-06
		95% Standard Bootstrap UCL 7.196E-06
Anderson-Darling Test Statistic	0.549	95% Bootstrap-t UCL 1.079E-05
Anderson-Darling 5% Critical Value	0.715	95% Hall's Bootstrap UCL 1.026E-05
Kolmogorov-Smirnov Test Statistic	0.31	95% Percentile Bootstrap UCL 7.427E-06
Kolmogorov-Smirnov 5% Critical Value	0.341	95% BCA Bootstrap UCL 7.458E-06
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.252E-05
		97.5% Chebyshev(Mean, Sd) UCL 1.602E-05
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.291E-05
95% Approximate Gamma UCL	1.372E-05	
95% Adjusted Gamma UCL	2.198E-05	

Potential UCL to Use		
		Use 95% Student's-t UCL 8.166E-06

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SS_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SS_ZINC

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	30.1	Minimum of Log Data	3.405
Maximum	429	Maximum of Log Data	6.061
Mean	131.7	Mean of log Data	4.391
Median	61.9	SD of log Data	1.037
SD	154.8		
Coefficient of Variation	1.175		
Skewness	1.906		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.74	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	259.1	95% H-UCL	996.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	346.4
95% Adjusted-CLT UCL	288.2	97.5% Chebyshev (MVUE) UCL	443
95% Modified-t UCL	267.3	99% Chebyshev (MVUE) UCL	632.7

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.691	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	190.6	
MLE of Mean	131.7	
MLE of Standard Deviation	158.4	
nu star	8.293	
Approximate Chi Square Value (.05)	2.906	**Nonparametric Statistics**
Adjusted Level of Significance	0.0122	95% CLT UCL 235.7
Adjusted Chi Square Value	1.884	95% Jackknife UCL 259.1
		95% Standard Bootstrap UCL 227.5
Anderson-Darling Test Statistic	0.485	95% Bootstrap-t UCL 816.6
Anderson-Darling 5% Critical Value	0.713	95% Hall's Bootstrap UCL 796.9
Kolmogorov-Smirnov Test Statistic	0.257	95% Percentile Bootstrap UCL 239.2
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL 270.2
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 407.2
		97.5% Chebyshev(Mean, Sd) UCL 526.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 760.6
95% Approximate Gamma UCL	375.9	
95% Adjusted Gamma UCL	579.7	

Potential UCL to Use	Use 95% Approximate Gamma UCL 375.9

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_2-METHYLNAPHTHALENE.w
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_2-METHYLNAPHTHALENE

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.016	Minimum Detected	-4.135
Maximum Detected	0.15	Maximum Detected	-1.897
Mean of Detected	0.0643	Mean of Detected	-3.178
SD of Detected	0.0633	SD of Detected	1.109
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.86	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0819	Mean	-2.714
SD	0.0422	SD	0.809
95% DL/2 (t) UCL	0.108	95% H-Stat (DL/2) UCL	0.979
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.178
		SD in Log Scale	0.934
		Mean in Original Scale	0.0603
		SD in Original Scale	0.053
		95% Percentile Bootstrap UCL	0.0889
		95% BCA Bootstrap UCL	0.0934

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.491	**Data appear Normal at 5% Significance Level**	
Theta Star	0.131		
nu star	3.927		
A-D Test Statistic	0.418	**Nonparametric Statistics**	
5% A-D Critical Value	0.664	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.664	Mean	0.0643
5% K-S Critical Value	0.401	SD	0.0548
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0316
		95% KM (t) UCL	0.123
Assuming Gamma Distribution		95% KM (z) UCL	0.116
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.128
Minimum	0.00301	95% KM (bootstrap t) UCL	0.19
Maximum	0.15	95% KM (BCA) UCL	0.112
Mean	0.0629	95% KM (Percentile Bootstrap) UCL	0.117
Median	0.0519	95% KM (Chebyshev) UCL	0.202
SD	0.0545	97.5% KM (Chebyshev) UCL	0.262
k star	0.827	99% KM (Chebyshev) UCL	0.379
Theta star	0.076		
Nu star	14.88	**Potential UCLs to Use**	
AppChi2	7.181	95% KM (t) UCL	0.123
95% Gamma Approximate UCL	0.13	95% KM (Percentile Bootstrap) UCL	0.117
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_ALUMINUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ALUMINUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	25.9	Minimum of Log Data	3.254
Maximum	106	Maximum of Log Data	4.663
Mean	44.86	Mean of log Data	3.673
Median	33.6	SD of log Data	0.501
SD	28.25		
Coefficient of Variation	0.63		
Skewness	1.771		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.69	Shapiro Wilk Test Statistic	0.773
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	62.36	95% H-UCL	66.19
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	76.37
95% Adjusted-CLT UCL	66.28	97.5% Chebyshev (MVUE) UCL	90.41
95% Modified-t UCL	63.29	99% Chebyshev (MVUE) UCL	118

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.729	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	16.44	
MLE of Mean	44.86	
MLE of Standard Deviation	27.16	
nu star	49.11	
Approximate Chi Square Value (.05)	34.02	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 60.34
Adjusted Chi Square Value	31.4	95% Jackknife UCL 62.36
		95% Standard Bootstrap UCL 59.48
Anderson-Darling Test Statistic	1.151	95% Bootstrap-t UCL 139.3
Anderson-Darling 5% Critical Value	0.725	95% Hall's Bootstrap UCL 167.7
Kolmogorov-Smirnov Test Statistic	0.356	95% Percentile Bootstrap UCL 61.11
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL 65.14
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 85.89
		97.5% Chebyshev(Mean, Sd) UCL 103.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 138.5
95% Approximate Gamma UCL	64.75	
95% Adjusted Gamma UCL	70.17	

Potential UCL to Use		
		Use 95% Chebyshev (Mean, Sd) UCL 85.89

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_ANTIMONY.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ANTIMONY

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	0.12	Minimum of Log Data	-2.12
Maximum	0.3	Maximum of Log Data	-1.204
Mean	0.212	Mean of log Data	-1.594
Median	0.19	SD of log Data	0.318
SD	0.0653		
Coefficient of Variation	0.308		
Skewness	0.202		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.913	Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.253	95% H-UCL	0.268
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.311
95% Adjusted-CLT UCL	0.25	97.5% Chebyshev (MVUE) UCL	0.354
95% Modified-t UCL	0.253	99% Chebyshev (MVUE) UCL	0.438

Gamma Distribution Test		Data Distribution
k star (bias corrected)	7.791	**Data appear Normal at 5% Significance Level**
Theta Star	0.0272	
MLE of Mean	0.212	
MLE of Standard Deviation	0.076	
nu star	140.2	
Approximate Chi Square Value (.05)	113.9	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.248
Adjusted Chi Square Value	108.9	95% Jackknife UCL 0.253
		95% Standard Bootstrap UCL 0.246
Anderson-Darling Test Statistic	0.365	95% Bootstrap-t UCL 0.256
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 0.244
Kolmogorov-Smirnov Test Statistic	0.194	95% Percentile Bootstrap UCL 0.247
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 0.247
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.307
		97.5% Chebyshev(Mean, Sd) UCL 0.348
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.429
95% Approximate Gamma UCL	0.261	
95% Adjusted Gamma UCL	0.273	

Potential UCL to Use		
		Use 95% Student's-t UCL 0.253

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_ARSENIC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ARSENIC

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	2.6	Minimum of Log Data	0.956
Maximum	6.4	Maximum of Log Data	1.856
Mean	3.956	Mean of log Data	1.339
Median	3.6	SD of log Data	0.281
SD	1.18		
Coefficient of Variation	0.298		
Skewness	1.136		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.901	Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.687	95% H-UCL	4.834
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.569
95% Adjusted-CLT UCL	4.762	97.5% Chebyshev (MVUE) UCL	6.269
95% Modified-t UCL	4.712	99% Chebyshev (MVUE) UCL	7.645

Gamma Distribution Test		Data Distribution
k star (bias corrected)	9.376	**Data appear Normal at 5% Significance Level**
Theta Star	0.422	
MLE of Mean	3.956	
MLE of Standard Deviation	1.292	
nu star	168.8	
Approximate Chi Square Value (.05)	139.7	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 4.603
Adjusted Chi Square Value	134.2	95% Jackknife UCL 4.687
		95% Standard Bootstrap UCL 4.565
Anderson-Darling Test Statistic	0.346	95% Bootstrap-t UCL 5.027
Anderson-Darling 5% Critical Value	0.721	95% Hall's Bootstrap UCL 6.164
Kolmogorov-Smirnov Test Statistic	0.229	95% Percentile Bootstrap UCL 4.6
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 4.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 5.67
		97.5% Chebyshev(Mean, Sd) UCL 6.412
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 7.87
95% Approximate Gamma UCL	4.778	
95% Adjusted Gamma UCL	4.976	

Potential UCL to Use		
	Use 95% Student's-t UCL	4.687

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_CHROMIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_CHROMIUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	3.4	Minimum of Log Data	1.224
Maximum	14.2	Maximum of Log Data	2.653
Mean	6.4	Mean of log Data	1.688
Median	3.8	SD of log Data	0.588
SD	4.238		
Coefficient of Variation	0.662		
Skewness	1.128		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.724	Shapiro Wilk Test Statistic	0.735
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9.027	95% H-UCL	10.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	11.76
95% Adjusted-CLT UCL	9.291	97.5% Chebyshev (MVUE) UCL	14.13
95% Modified-t UCL	9.115	99% Chebyshev (MVUE) UCL	18.78

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.156	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	2.968	
MLE of Mean	6.4	
MLE of Standard Deviation	4.358	
nu star	38.82	
Approximate Chi Square Value (.05)	25.55	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 8.723
Adjusted Chi Square Value	23.3	95% Jackknife UCL 9.027
		95% Standard Bootstrap UCL 8.596
Anderson-Darling Test Statistic	1.287	95% Bootstrap-t UCL 10.77
Anderson-Darling 5% Critical Value	0.727	95% Hall's Bootstrap UCL 8.324
Kolmogorov-Smirnov Test Statistic	0.384	95% Percentile Bootstrap UCL 8.744
Kolmogorov-Smirnov 5% Critical Value	0.281	95% BCA Bootstrap UCL 9.111
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 12.56
		97.5% Chebyshev(Mean, Sd) UCL 15.22
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 20.45
95% Approximate Gamma UCL	9.725	
95% Adjusted Gamma UCL	10.66	

Potential UCL to Use		
		Use 95% Chebyshev (Mean, Sd) UCL 12.56

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_COBALT.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COBALT

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	0.26	Minimum of Log Data	-1.347
Maximum	0.68	Maximum of Log Data	-0.386
Mean	0.402	Mean of log Data	-0.952
Median	0.36	SD of log Data	0.298
SD	0.131		
Coefficient of Variation	0.325		
Skewness	1.301		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.886	Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.483	95% H-UCL	0.499
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.576
95% Adjusted-CLT UCL	0.494	97.5% Chebyshev (MVUE) UCL	0.652
95% Modified-t UCL	0.486	99% Chebyshev (MVUE) UCL	0.8

Gamma Distribution Test		Data Distribution
k star (bias corrected)	8.193	**Data appear Normal at 5% Significance Level**
Theta Star	0.0491	
MLE of Mean	0.402	
MLE of Standard Deviation	0.141	
nu star	147.5	
Approximate Chi Square Value (.05)	120.4	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.474
Adjusted Chi Square Value	115.3	95% Jackknife UCL 0.483
		95% Standard Bootstrap UCL 0.47
Anderson-Darling Test Statistic	0.342	95% Bootstrap-t UCL 0.526
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 0.529
Kolmogorov-Smirnov Test Statistic	0.207	95% Percentile Bootstrap UCL 0.473
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 0.489
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.592
		97.5% Chebyshev(Mean, Sd) UCL 0.674
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.835
95% Approximate Gamma UCL	0.493	
95% Adjusted Gamma UCL	0.515	

Potential UCL to Use		
	Use 95% Student's-t UCL	0.483

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_COPPER.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_COPPER

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	7

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.9	Minimum of Log Data	0.642
Maximum	2.6	Maximum of Log Data	0.956
Mean	2.189	Mean of log Data	0.778
Median	2.1	SD of log Data	0.113
SD	0.252		
Coefficient of Variation	0.115		
Skewness	0.641		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.888	Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.345	95% H-UCL	2.356
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.548
95% Adjusted-CLT UCL	2.346	97.5% Chebyshev (MVUE) UCL	2.703
95% Modified-t UCL	2.348	99% Chebyshev (MVUE) UCL	3.008

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	58.34	**Data appear Normal at 5% Significance Level**
Theta Star	0.0375	
MLE of Mean	2.189	
MLE of Standard Deviation	0.287	
nu star	1050	
Approximate Chi Square Value (.05)	975.9	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 2.327
Adjusted Chi Square Value	960.8	95% Jackknife UCL 2.345
		95% Standard Bootstrap UCL 2.321
Anderson-Darling Test Statistic	0.518	95% Bootstrap-t UCL 2.376
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 2.32
Kolmogorov-Smirnov Test Statistic	0.231	95% Percentile Bootstrap UCL 2.322
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 2.344
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.555
		97.5% Chebyshev(Mean, Sd) UCL 2.714
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 3.025
95% Approximate Gamma UCL	2.355	
95% Adjusted Gamma UCL	2.393	

Potential UCL to Use		Use 95% Student's-t UCL	2.345

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_FLUORANTHENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_FLUORANTHENE

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	3	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.013	Minimum Detected	-4.343
Maximum Detected	0.56	Maximum Detected	-0.58
Mean of Detected	0.153	Mean of Detected	-3.187
SD of Detected	0.271	SD of Detected	1.75
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	88.89%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.64	Shapiro Wilk Test Statistic	0.728
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.121	Mean	-2.718
SD	0.169	SD	1.16
95% DL/2 (t) UCL	0.226	95% H-Stat (DL/2) UCL	3.574
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.577
		SD in Log Scale	1.292
		Mean in Original Scale	0.0832
		SD in Original Scale	0.18
		95% Percentile Bootstrap UCL	0.2
		95% BCA Bootstrap UCL	0.26

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.288	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.532		
nu star	2.306		
A-D Test Statistic	0.815	**Nonparametric Statistics**	
5% A-D Critical Value	0.682	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.682	Mean	0.0779
5% K-S Critical Value	0.411	SD	0.17
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0656
		95% KM (t) UCL	0.2
Assuming Gamma Distribution		95% KM (z) UCL	0.186
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.19
Minimum	1E-09	95% KM (bootstrap t) UCL	3.402
Maximum	0.56	95% KM (BCA) UCL	0.2
Mean	0.149	95% KM (Percentile Bootstrap) UCL	0.2
Median	0.117	95% KM (Chebyshev) UCL	0.364
SD	0.178	97.5% KM (Chebyshev) UCL	0.488
k star	0.255	99% KM (Chebyshev) UCL	0.731
Theta star	0.584		
Nu star	4.587	**Potential UCLs to Use**	
AppChi2	0.966	97.5% KM (Chebyshev) UCL	0.488
95% Gamma Approximate UCL	0.706		
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_IRON.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_IRON

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	70.2	Minimum of Log Data	4.251
Maximum	246	Maximum of Log Data	5.505
Mean	115.7	Mean of log Data	4.669
Median	103	SD of log Data	0.406
SD	55.83		
Coefficient of Variation	0.482		
Skewness	1.857		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.785	Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	150.3	95% H-UCL	157.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	183
95% Adjusted-CLT UCL	158.6	97.5% Chebyshev (MVUE) UCL	212.6
95% Modified-t UCL	152.2	99% Chebyshev (MVUE) UCL	270.7

Gamma Distribution Test		Data Distribution
k star (bias corrected)	4.265	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	27.13	
MLE of Mean	115.7	
MLE of Standard Deviation	56.03	
nu star	76.76	
Approximate Chi Square Value (.05)	57.58	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 146.3
Adjusted Chi Square Value	54.09	95% Jackknife UCL 150.3
		95% Standard Bootstrap UCL 144.3
Anderson-Darling Test Statistic	0.561	95% Bootstrap-t UCL 187
Anderson-Darling 5% Critical Value	0.723	95% Hall's Bootstrap UCL 290.3
Kolmogorov-Smirnov Test Statistic	0.219	95% Percentile Bootstrap UCL 147.7
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL 157.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 196.8
		97.5% Chebyshev(Mean, Sd) UCL 231.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 300.9
95% Approximate Gamma UCL	154.3	
95% Adjusted Gamma UCL	164.2	

Potential UCL to Use	Use 95% Approximate Gamma UCL 154.3

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_LEAD.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LEAD

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.021	Minimum Detected	-3.863
Maximum Detected	0.46	Maximum Detected	-0.777
Mean of Detected	0.125	Mean of Detected	-2.56
SD of Detected	0.147	SD of Detected	1.016
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.73	Shapiro Wilk Test Statistic	0.967
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.167	Mean	-2.353
SD	0.186	SD	1.136
95% DL/2 (t) UCL	0.282	95% H-Stat (DL/2) UCL	2.015
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.56
		SD in Log Scale	0.95
		Mean in Original Scale	0.12
		SD in Original Scale	0.138
		95% Percentile Bootstrap UCL	0.201
		95% BCA Bootstrap UCL	0.239

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.817	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.153		
nu star	13.08		
A-D Test Statistic	0.377	**Nonparametric Statistics**	
5% A-D Critical Value	0.733	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.733	Mean	0.125
5% K-S Critical Value	0.301	SD	0.137
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.052
		95% KM (t) UCL	0.222
Assuming Gamma Distribution		95% KM (z) UCL	0.211
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.223
Minimum	0.021	95% KM (bootstrap t) UCL	0.454
Maximum	0.46	95% KM (BCA) UCL	0.219
Mean	0.124	95% KM (Percentile Bootstrap) UCL	0.214
Median	0.077	95% KM (Chebyshev) UCL	0.352
SD	0.137	97.5% KM (Chebyshev) UCL	0.45
k star	0.945	99% KM (Chebyshev) UCL	0.642
Theta star	0.132		
Nu star	17.01	**Potential UCLs to Use**	
AppChi2	8.677	95% KM (Chebyshev) UCL	0.352
95% Gamma Approximate UCL	0.244		
95% Adjusted Gamma UCL	0.284		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_LPAHND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LPAHND0

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	0.02	Minimum of Log Data	-3.912
Maximum	0.789	Maximum of Log Data	-0.237
Mean	0.241	Mean of log Data	-2.212
Median	0.064	SD of log Data	1.418
SD	0.283		
Coefficient of Variation	1.174		
Skewness	1.176		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.803	Shapiro Wilk Test Statistic	0.905
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.416	95% H-UCL	2.503
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.784
95% Adjusted-CLT UCL	0.435	97.5% Chebyshev (MVUE) UCL	1.015
95% Modified-t UCL	0.422	99% Chebyshev (MVUE) UCL	1.469

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.58	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.415	
MLE of Mean	0.241	
MLE of Standard Deviation	0.316	
nu star	10.44	
Approximate Chi Square Value (.05)	4.216	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.396
Adjusted Chi Square Value	3.422	95% Jackknife UCL 0.416
		95% Standard Bootstrap UCL 0.387
Anderson-Darling Test Statistic	0.483	95% Bootstrap-t UCL 0.522
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL 0.427
Kolmogorov-Smirnov Test Statistic	0.26	95% Percentile Bootstrap UCL 0.394
Kolmogorov-Smirnov 5% Critical Value	0.289	95% BCA Bootstrap UCL 0.425
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.651
		97.5% Chebyshev(Mean, Sd) UCL 0.829
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.178
95% Approximate Gamma UCL	0.596	
95% Adjusted Gamma UCL	0.734	

Potential UCL to Use		
	Use 95% Approximate Gamma UCL	0.596

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_LPAHND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LPAHND1/2DL

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	0.682	Minimum of Log Data	-0.383
Maximum	1.147	Maximum of Log Data	0.137
Mean	0.871	Mean of log Data	-0.15
Median	0.82	SD of log Data	0.161
SD	0.148		
Coefficient of Variation	0.169		
Skewness	1.067		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.861	Shapiro Wilk Test Statistic	0.892
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.962	95% H-UCL	0.97
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.075
95% Adjusted-CLT UCL	0.97	97.5% Chebyshev (MVUE) UCL	1.163
95% Modified-t UCL	0.965	99% Chebyshev (MVUE) UCL	1.337

Gamma Distribution Test		Data Distribution
k star (bias corrected)	28.09	**Data appear Normal at 5% Significance Level**
Theta Star	0.031	
MLE of Mean	0.871	
MLE of Standard Deviation	0.164	
nu star	505.6	
Approximate Chi Square Value (.05)	454.4	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.952
Adjusted Chi Square Value	444.2	95% Jackknife UCL 0.962
		95% Standard Bootstrap UCL 0.947
Anderson-Darling Test Statistic	0.646	95% Bootstrap-t UCL 1.051
Anderson-Darling 5% Critical Value	0.721	95% Hall's Bootstrap UCL 1.641
Kolmogorov-Smirnov Test Statistic	0.285	95% Percentile Bootstrap UCL 0.95
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 0.964
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.085
		97.5% Chebyshev(Mean, Sd) UCL 1.178
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.36
95% Approximate Gamma UCL	0.969	
95% Adjusted Gamma UCL	0.991	

Potential UCL to Use		
		Use 95% Student's-t UCL 0.962

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_LPAHNDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_LPAHNDDL

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	1.157	Minimum of Log Data	0.146
Maximum	1.717	Maximum of Log Data	0.541
Mean	1.501	Mean of log Data	0.4
Median	1.562	SD of log Data	0.12
SD	0.169		
Coefficient of Variation	0.113		
Skewness	-1.047		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.907	Shapiro Wilk Test Statistic	0.879
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.606	95% H-UCL	1.624
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.762
95% Adjusted-CLT UCL	1.572	97.5% Chebyshev (MVUE) UCL	1.875
95% Modified-t UCL	1.602	99% Chebyshev (MVUE) UCL	2.098

Gamma Distribution Test		Data Distribution
k star (bias corrected)	54.66	**Data appear Normal at 5% Significance Level**
Theta Star	0.0275	
MLE of Mean	1.501	
MLE of Standard Deviation	0.203	
nu star	983.9	
Approximate Chi Square Value (.05)	912.1	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 1.594
Adjusted Chi Square Value	897.4	95% Jackknife UCL 1.606
		95% Standard Bootstrap UCL 1.589
Anderson-Darling Test Statistic	0.542	95% Bootstrap-t UCL 1.586
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 1.577
Kolmogorov-Smirnov Test Statistic	0.274	95% Percentile Bootstrap UCL 1.583
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 1.574
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.747
		97.5% Chebyshev(Mean, Sd) UCL 1.853
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.062
95% Approximate Gamma UCL	1.619	
95% Adjusted Gamma UCL	1.645	

Potential UCL to Use		
		Use 95% Student's-t UCL 1.606

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_MANGANESE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_MANGANESE

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	20.9	Minimum of Log Data	3.04
Maximum	85.4	Maximum of Log Data	4.447
Mean	43.73	Mean of log Data	3.633
Median	27.6	SD of log Data	0.556
SD	25.95		
Coefficient of Variation	0.593		
Skewness	0.85		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.771	Shapiro Wilk Test Statistic	0.82
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	59.82	95% H-UCL	69.81
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	78.91
95% Adjusted-CLT UCL	60.58	97.5% Chebyshev (MVUE) UCL	94.31
95% Modified-t UCL	60.23	99% Chebyshev (MVUE) UCL	124.6

Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.479	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	17.64	
MLE of Mean	43.73	
MLE of Standard Deviation	27.78	
nu star	44.63	
Approximate Chi Square Value (.05)	30.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 57.96
Adjusted Chi Square Value	27.84	95% Jackknife UCL 59.82
		95% Standard Bootstrap UCL 57.2
Anderson-Darling Test Statistic	0.94	95% Bootstrap-t UCL 63.59
Anderson-Darling 5% Critical Value	0.726	95% Hall's Bootstrap UCL 53.21
Kolmogorov-Smirnov Test Statistic	0.291	95% Percentile Bootstrap UCL 57.71
Kolmogorov-Smirnov 5% Critical Value	0.281	95% BCA Bootstrap UCL 59.92
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 81.44
		97.5% Chebyshev(Mean, Sd) UCL 97.75
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 129.8
95% Approximate Gamma UCL	64.4	
95% Adjusted Gamma UCL	70.11	

Potential UCL to Use		
		Use 95% Chebyshev (Mean, Sd) UCL 81.44

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_NAPHTHALENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NAPHTHALENE

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
		Percent Non-Detects	44.44%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.042	Minimum Detected	-3.17
Maximum Detected	0.36	Maximum Detected	-1.022
Mean of Detected	0.142	Mean of Detected	-2.327
SD of Detected	0.138	SD of Detected	0.956
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	77.78%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.806	Shapiro Wilk Test Statistic	0.86
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.122	Mean	-2.333
SD	0.101	SD	0.676
95% DL/2 (t) UCL	0.184	95% H-Stat (DL/2) UCL	0.638
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.593
		SD in Log Scale	0.79
		Mean in Original Scale	0.104
		SD in Original Scale	0.108
		95% Percentile Bootstrap UCL	0.167
		95% BCA Bootstrap UCL	0.19

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.722	**Data appear Normal at 5% Significance Level**	
Theta Star	0.197		
nu star	7.225		
A-D Test Statistic	0.508	**Nonparametric Statistics**	
5% A-D Critical Value	0.687	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.687	Mean	0.101
5% K-S Critical Value	0.362	SD	0.103
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0385
		95% KM (t) UCL	0.173
Assuming Gamma Distribution		95% KM (z) UCL	0.165
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.169
Minimum	0.042	95% KM (bootstrap t) UCL	0.558
Maximum	0.36	95% KM (BCA) UCL	0.183
Mean	0.141	95% KM (Percentile Bootstrap) UCL	0.174
Median	0.14	95% KM (Chebyshev) UCL	0.269
SD	0.0981	97.5% KM (Chebyshev) UCL	0.342
k star	1.754	99% KM (Chebyshev) UCL	0.484
Theta star	0.0802		
Nu star	31.58	**Potential UCLs to Use**	
AppChi2	19.74	95% KM (t) UCL	0.173
95% Gamma Approximate UCL	0.225	95% KM (Percentile Bootstrap) UCL	0.174
95% Adjusted Gamma UCL	0.25		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_NICKEL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_NICKEL

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	4.3	Minimum of Log Data	1.459
Maximum	6.6	Maximum of Log Data	1.887
Mean	5.189	Mean of log Data	1.637
Median	5	SD of log Data	0.143
SD	0.759		
Coefficient of Variation	0.146		
Skewness	0.709		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.959
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.659	95% H-UCL	5.704
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.264
95% Adjusted-CLT UCL	5.669	97.5% Chebyshev (MVUE) UCL	6.73
95% Modified-t UCL	5.669	99% Chebyshev (MVUE) UCL	7.645

Gamma Distribution Test		Data Distribution
k star (bias corrected)	36.48	**Data appear Normal at 5% Significance Level**
Theta Star	0.142	
MLE of Mean	5.189	
MLE of Standard Deviation	0.859	
nu star	656.7	
Approximate Chi Square Value (.05)	598.3	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 5.605
Adjusted Chi Square Value	586.5	95% Jackknife UCL 5.659
		95% Standard Bootstrap UCL 5.579
Anderson-Darling Test Statistic	0.23	95% Bootstrap-t UCL 5.77
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 5.716
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL 5.6
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 5.644
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 6.292
		97.5% Chebyshev(Mean, Sd) UCL 6.769
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 7.706
95% Approximate Gamma UCL	5.696	
95% Adjusted Gamma UCL	5.811	

Potential UCL to Use		
		Use 95% Student's-t UCL 5.659

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_PHENANTHRENE.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_PHENANTHRENE

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
		Percent Non-Detects	44.44%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.057	Minimum Detected	-2.865
Maximum Detected	0.13	Maximum Detected	-2.04
Mean of Detected	0.0878	Mean of Detected	-2.482
SD of Detected	0.0312	SD of Detected	0.351
Minimum Non-Detect	0.19	Minimum Non-Detect	-1.661
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.915	Shapiro Wilk Test Statistic	0.934
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0916	Mean	-2.42
SD	0.0225	SD	0.26
95% DL/2 (t) UCL	0.106	95% H-Stat (DL/2) UCL	0.307
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.482
		SD in Log Scale	0.293
		Mean in Original Scale	0.0868
		SD in Original Scale	0.0257
		95% Percentile Bootstrap UCL	0.1
		95% BCA Bootstrap UCL	0.102

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	4.221	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0208		
nu star	42.21		
A-D Test Statistic	0.307	**Nonparametric Statistics**	
5% A-D Critical Value	0.679	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.679	Mean	0.0878
5% K-S Critical Value	0.358	SD	0.0279
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0139
		95% KM (t) UCL	0.114
Assuming Gamma Distribution		95% KM (z) UCL	0.111
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.115
Minimum	0.057	95% KM (bootstrap t) UCL	0.153
Maximum	0.13	95% KM (BCA) UCL	0.109
Mean	0.0886	95% KM (Percentile Bootstrap) UCL	0.11
Median	0.0916	95% KM (Chebyshev) UCL	0.149
SD	0.0258	97.5% KM (Chebyshev) UCL	0.175
k star	8.813	99% KM (Chebyshev) UCL	0.226
Theta star	0.0101		
Nu star	158.6	**Potential UCLs to Use**	
AppChi2	130.5	95% KM (t) UCL	0.114
95% Gamma Approximate UCL	0.108	95% KM (Percentile Bootstrap) UCL	0.11
95% Adjusted Gamma UCL	0.112		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_SELENIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_SELENIUM

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		**Log-transformed Statistics**	
Minimum	6.6	Minimum of Log Data	1.887
Maximum	17.1	Maximum of Log Data	2.839
Mean	10.29	Mean of log Data	2.276
Median	9.3	SD of log Data	0.347
SD	3.683		
Coefficient of Variation	0.358		
Skewness	0.74		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.902	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12.57	95% H-UCL	13.34
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15.5
95% Adjusted-CLT UCL	12.63	97.5% Chebyshev (MVUE) UCL	17.76
95% Modified-t UCL	12.62	99% Chebyshev (MVUE) UCL	22.2

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	6.284	**Data appear Normal at 5% Significance Level**
Theta Star	1.637	
MLE of Mean	10.29	
MLE of Standard Deviation	4.104	
nu star	113.1	
Approximate Chi Square Value (.05)	89.57	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 12.31
Adjusted Chi Square Value	85.15	95% Jackknife UCL 12.57
		95% Standard Bootstrap UCL 12.16
Anderson-Darling Test Statistic	0.378	95% Bootstrap-t UCL 13.07
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 12.48
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL 12.19
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 12.46
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 15.64
		97.5% Chebyshev(Mean, Sd) UCL 17.96
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 22.5
95% Approximate Gamma UCL	12.99	
95% Adjusted Gamma UCL	13.67	

Potential UCL to Use		
		Use 95% Student's-t UCL 12.57

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_THALLIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_THALLIUM

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
		Percent Non-Detects	55.56%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.022	Minimum Detected	-3.817
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.0615	Mean of Detected	-2.92
SD of Detected	0.0319	SD of Detected	0.639
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.305	Mean	-1.683
SD	0.232	SD	1.237
95% DL/2 (t) UCL	0.449	95% H-Stat (DL/2) UCL	40.52
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.92
		SD in Log Scale	0.588
		Mean in Original Scale	0.0621
		SD in Original Scale	0.0331
		95% Percentile Bootstrap UCL	0.0797
		95% BCA Bootstrap UCL	0.0803

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.157	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0531		
nu star	9.257		
A-D Test Statistic	0.362	**Nonparametric Statistics**	
5% A-D Critical Value	0.659	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.659	Mean	0.0615
5% K-S Critical Value	0.396	SD	0.0276
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0159
		95% KM (t) UCL	0.0911
Assuming Gamma Distribution		95% KM (z) UCL	0.0877
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0937
Minimum	0.0215	95% KM (bootstrap t) UCL	0.0898
Maximum	0.1	95% KM (BCA) UCL	0.087
Mean	0.0615	95% KM (Percentile Bootstrap) UCL	0.087
Median	0.0619	95% KM (Chebyshev) UCL	0.131
SD	0.0294	97.5% KM (Chebyshev) UCL	0.161
k star	2.73	99% KM (Chebyshev) UCL	0.22
Theta star	0.0225		
Nu star	49.13	**Potential UCLs to Use**	
AppChi2	34.04	95% KM (t) UCL	0.0911
95% Gamma Approximate UCL	0.0887	95% KM (Percentile Bootstrap) UCL	0.087
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_TOTAL PAH ND0.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_TOTAL PAH (ND=0)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	0.02	Minimum of Log Data	-3.912
Maximum	1.507	Maximum of Log Data	0.41
Mean	0.372	Mean of log Data	-1.786
Median	0.207	SD of log Data	1.448
SD	0.474		
Coefficient of Variation	1.274		
Skewness	2.001		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.755	Shapiro Wilk Test Statistic	0.949
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.666	95% H-UCL	4.34
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1.257
95% Adjusted-CLT UCL	0.745	97.5% Chebyshev (MVUE) UCL	1.63
95% Modified-t UCL	0.684	99% Chebyshev (MVUE) UCL	2.362

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.574	**Data appear Gamma Distributed at 5% Significance Level**
Theta Star	0.648	
MLE of Mean	0.372	
MLE of Standard Deviation	0.491	
nu star	10.34	
Approximate Chi Square Value (.05)	4.154	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 0.632
Adjusted Chi Square Value	3.368	95% Jackknife UCL 0.666
		95% Standard Bootstrap UCL 0.616
Anderson-Darling Test Statistic	0.331	95% Bootstrap-t UCL 0.942
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL 1.619
Kolmogorov-Smirnov Test Statistic	0.223	95% Percentile Bootstrap UCL 0.644
Kolmogorov-Smirnov 5% Critical Value	0.289	95% BCA Bootstrap UCL 0.748
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 1.061
		97.5% Chebyshev(Mean, Sd) UCL 1.359
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 1.944
95% Approximate Gamma UCL	0.926	
95% Adjusted Gamma UCL	1.143	

Potential UCL to Use		
		Use 95% Approximate Gamma UCL 0.926

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_TOTAL PAH ND12DL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_TOTAL PAH (ND=1/2DL)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	1.286	Minimum of Log Data	0.252
Maximum	2.077	Maximum of Log Data	0.731
Mean	1.704	Mean of log Data	0.524
Median	1.672	SD of log Data	0.141
SD	0.236		
Coefficient of Variation	0.139		
Skewness	0.0118		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1.85	95% H-UCL	1.872
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.055
95% Adjusted-CLT UCL	1.834	97.5% Chebyshev (MVUE) UCL	2.206
95% Modified-t UCL	1.85	99% Chebyshev (MVUE) UCL	2.504

Gamma Distribution Test		Data Distribution
k star (bias corrected)	38.31	**Data appear Normal at 5% Significance Level**
Theta Star	0.0445	
MLE of Mean	1.704	
MLE of Standard Deviation	0.275	
nu star	689.5	
Approximate Chi Square Value (.05)	629.6	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 1.833
Adjusted Chi Square Value	617.5	95% Jackknife UCL 1.85
		95% Standard Bootstrap UCL 1.826
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL 1.867
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL 1.901
Kolmogorov-Smirnov Test Statistic	0.193	95% Percentile Bootstrap UCL 1.827
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 1.824
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 2.047
		97.5% Chebyshev(Mean, Sd) UCL 2.196
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 2.487
95% Approximate Gamma UCL	1.866	
95% Adjusted Gamma UCL	1.903	

Potential UCL to Use		
		Use 95% Student's-t UCL 1.85

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_TOTAL PAH NDDL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_TOTAL PAH (ND=DL)

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	2.086	Minimum of Log Data	0.735
Maximum	3.427	Maximum of Log Data	1.232
Mean	3.036	Mean of log Data	1.1
Median	3.25	SD of log Data	0.159
SD	0.432		
Coefficient of Variation	0.142		
Skewness	-1.599		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.798	Shapiro Wilk Test Statistic	0.762
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	3.303	95% H-UCL	3.38
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3.741
95% Adjusted-CLT UCL	3.19	97.5% Chebyshev (MVUE) UCL	4.045
95% Modified-t UCL	3.29	99% Chebyshev (MVUE) UCL	4.643

Gamma Distribution Test		Data Distribution
k star (bias corrected)	32.18	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	0.0943	
MLE of Mean	3.036	
MLE of Standard Deviation	0.535	
nu star	579.2	
Approximate Chi Square Value (.05)	524.4	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 3.272
Adjusted Chi Square Value	513.4	95% Jackknife UCL 3.303
		95% Standard Bootstrap UCL 3.259
Anderson-Darling Test Statistic	0.957	95% Bootstrap-t UCL 3.24
Anderson-Darling 5% Critical Value	0.721	95% Hall's Bootstrap UCL 3.205
Kolmogorov-Smirnov Test Statistic	0.32	95% Percentile Bootstrap UCL 3.242
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 3.216
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 3.663
		97.5% Chebyshev(Mean, Sd) UCL 3.934
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 4.467
95% Approximate Gamma UCL	3.353	
95% Adjusted Gamma UCL	3.425	

Potential UCL to Use	
Use 95% Student's-t UCL	3.303
or 95% Modified-t UCL	3.29

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_VANADIUM.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_VANADIUM

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	1
		Percent Non-Detects	11.11%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.53	Minimum Detected	-0.635
Maximum Detected	2.1	Maximum Detected	0.742
Mean of Detected	1.244	Mean of Detected	0.129
SD of Detected	0.543	SD of Detected	0.463
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.94	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.161	Mean	0.0377
SD	0.565	SD	0.512
95% DL/2 (t) UCL	1.511	95% H-Stat (DL/2) UCL	2.126
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.106	Mean in Log Scale	0.078
SD	0.623	SD in Log Scale	0.459
95% MLE (t) UCL	1.493	Mean in Original Scale	1.185
95% MLE (Tiku) UCL	1.558	SD in Original Scale	0.537
		95% Percentile Bootstrap UCL	1.474
		95% BCA Bootstrap UCL	1.503

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	3.691	**Data appear Normal at 5% Significance Level**	
Theta Star	0.337		
nu star	59.05		
A-D Test Statistic	0.246	**Nonparametric Statistics**	
5% A-D Critical Value	0.718	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.718	Mean	1.185
5% K-S Critical Value	0.295	SD	0.508
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.182
		95% KM (t) UCL	1.524
Assuming Gamma Distribution		95% KM (z) UCL	1.485
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.523
Minimum	0.53	95% KM (bootstrap t) UCL	1.596
Maximum	2.1	95% KM (BCA) UCL	1.487
Mean	1.2	95% KM (Percentile Bootstrap) UCL	1.489
Median	1.2	95% KM (Chebyshev) UCL	1.979
SD	0.524	97.5% KM (Chebyshev) UCL	2.323
k star	4.07	99% KM (Chebyshev) UCL	2.997
Theta star	0.295		
Nu star	73.26	**Potential UCLs to Use**	
AppChi2	54.55	95% KM (t) UCL	1.524
95% Gamma Approximate UCL	1.611	95% KM (Percentile Bootstrap) UCL	1.489
95% Adjusted Gamma UCL	1.718		

Note: DL/2 is not a recommended method.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\temp\Sparrows Point IGA\ProUCL\background April 2011\inp_PRBKGD-SW_N_ZINC.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	10000

SW_ZINC

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	3.6	Minimum of Log Data	1.281
Maximum	9	Maximum of Log Data	2.197
Mean	5.478	Mean of log Data	1.652
Median	5.1	SD of log Data	0.326
SD	1.867		
Coefficient of Variation	0.341		
Skewness	0.85		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.883	Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6.635	95% H-UCL	6.959
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	8.073
95% Adjusted-CLT UCL	6.69	97.5% Chebyshev (MVUE) UCL	9.199
95% Modified-t UCL	6.665	99% Chebyshev (MVUE) UCL	11.41

Gamma Distribution Test		Data Distribution
k star (bias corrected)	7.055	**Data appear Normal at 5% Significance Level**
Theta Star	0.776	
MLE of Mean	5.478	
MLE of Standard Deviation	2.062	
nu star	127	
Approximate Chi Square Value (.05)	102	**Nonparametric Statistics**
Adjusted Level of Significance	0.0231	95% CLT UCL 6.502
Adjusted Chi Square Value	97.24	95% Jackknife UCL 6.635
		95% Standard Bootstrap UCL 6.447
Anderson-Darling Test Statistic	0.47	95% Bootstrap-t UCL 6.991
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL 6.59
Kolmogorov-Smirnov Test Statistic	0.25	95% Percentile Bootstrap UCL 6.467
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL 6.589
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 8.191
		97.5% Chebyshev(Mean, Sd) UCL 9.365
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 11.67
95% Approximate Gamma UCL	6.822	
95% Adjusted Gamma UCL	7.154	

Potential UCL to Use		
	Use 95% Student's-t UCL	6.635

APPENDIX C:

FOOD WEB MODELS

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TABLE C.1
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	2.07E-06	3.48E-07	0.00E+00	2.42E-06	3.85E-07	6.48E-08	0.00E+00	4.50E-07
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	1.89E-07	1.02E-07	0.00E+00	2.91E-07	5.78E-08	3.11E-08	0.00E+00	8.89E-08
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	1.80E-08	1.27E-08	0.00E+00	3.07E-08	8.84E-09	6.25E-09	0.00E+00	1.51E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	7.20E-09	1.65E-08	0.00E+00	2.37E-08	2.80E-09	6.40E-09	0.00E+00	9.20E-09
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	3.24E-08	2.70E-07	0.00E+00	3.03E-07	1.36E-08	1.13E-07	0.00E+00	1.27E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	6.21E-08	6.50E-07	0.00E+00	7.13E-07	1.94E-08	2.03E-07	0.00E+00	2.22E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	1.17E-08	9.76E-08	0.00E+00	1.09E-07	6.99E-09	5.83E-08	0.00E+00	6.53E-08
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	3.24E-08	3.16E-08	0.00E+00	6.40E-08	1.09E-08	1.07E-08	0.00E+00	2.16E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	1.26E-09	2.42E-08	0.00E+00	2.54E-08	9.23E-10	1.77E-08	0.00E+00	1.86E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	9.90E-09	3.68E-07	0.00E+00	3.78E-07	3.49E-09	1.30E-07	0.00E+00	1.33E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	1.17E-08	6.30E-09	0.00E+00	1.80E-08	6.45E-09	3.48E-09	0.00E+00	9.93E-09
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	1.08E-08	9.01E-08	0.00E+00	1.01E-07	5.24E-09	4.37E-08	0.00E+00	4.90E-08
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	1.26E-08	4.63E-07	0.00E+00	4.75E-07	6.99E-09	2.57E-07	0.00E+00	2.64E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	3.87E-09	1.82E-07	0.00E+00	1.86E-07	1.55E-09	7.29E-08	0.00E+00	7.44E-08
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	2.61E-08	9.54E-07	0.00E+00	9.80E-07	1.05E-08	3.82E-07	0.00E+00	3.92E-07
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	2.97E-05	2.50E-06	0.00E+00	3.22E-05	5.98E-06	5.03E-07	0.00E+00	6.48E-06
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	7.92E-07	1.76E-06	0.00E+00	2.55E-06	2.40E-07	5.33E-07	0.00E+00	7.74E-07
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	7.07E-08	2.03E-06	0.00E+00	2.10E-06	2.89E-08	8.69E-07	0.00E+00	8.98E-07
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	7.56E-02	1.51E+01	0.00E+00	1.52E+01	3.03E-02	6.06E+00	0.00E+00	6.09E+00
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	4.00E-03	Benthic Tissue	1.00E+02	8.87E+01	2.26E+01	1.81E+01	4.07E-03	4.07E+01	2.00E+01	1.60E+01	1.90E-03	3.59E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	3.15E-02	Benthic Tissue	1.04E-01	4.47E-02	2.97E-03	1.87E-02	1.44E-05	2.17E-02	1.28E-03	8.04E-03	9.41E-06	9.33E-03
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	5.41E-02	Benthic Tissue	3.89E+00	1.49E+00	6.48E-02	7.01E-01	3.42E-04	7.66E-01	2.49E-02	2.69E-01	1.97E-04	2.94E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	1.98E-03	0.00E+00	2.12E-06	1.98E-03	1.49E-03	0.00E+00	2.12E-06	1.50E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	7.76E-03	Benthic Tissue	5.97E-02	2.30E-02	6.93E-03	1.08E-02	0.00E+00	1.77E-02	2.67E-03	4.14E-03	0.00E+00	6.81E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	4.68E-03	Benthic Tissue	2.36E+00	1.11E+00	4.54E-01	4.24E-01	2.21E-04	8.78E-01	2.13E-01	1.99E-01	1.67E-04	4.12E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	9.67E-03	Benthic Tissue	5.12E-01	2.84E-01	4.77E-02	9.22E-02	2.34E-05	1.40E-01	2.64E-02	5.11E-02	1.77E-05	7.75E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	7.75E-03	Benthic Tissue	4.61E+00	1.33E+00	5.36E-01	8.30E-01	1.31E-04	1.37E+00	1.55E-01	2.40E-01	1.05E-04	3.95E-01
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	4.63E-03	Benthic Tissue	5.56E+02	3.54E+02	1.08E+02	1.00E+02	9.54E-03	2.08E+02	6.87E+01	6.37E+01	4.67E-03	1.32E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	3.62E-03	Benthic Tissue	4.64E+00	1.27E+00	1.15E+00	8.35E-01	2.52E-05	1.99E+00	3.15E-01	2.29E-01	8.69E-06	5.44E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	5.47E-03	Benthic Tissue	8.69E+00	6.94E+00	1.43E+00	1.56E+00	8.91E-03	3.00E+00	1.14E+00	1.25E+00	3.15E-03	2.40E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	1.43E-02	Benthic Tissue	2.44E-02	9.83E-03	1.53E-03	4.38E-03	2.84E-06	5.92E-03	6.17E-04	1.77E-03	2.58E-06	2.39E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	1.14E-02	Benthic Tissue	6.42E-01	4.86E-01	5.08E-02	1.16E-01	3.56E-04	1.67E-01	3.84E-02	8.74E-02	2.86E-04	1.26E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	5.24E-02	Benthic Tissue	6.45E-01	2.42E-01	1.11E-02	1.16E-01	1.10E-03	1.28E-01	4.15E-03	4.36E-02	6.06E-04	4.83E-02
SILVER	--	2.80E+00	1.39E+00	--	--	2.02E-02	Benthic Tissue	5.66E-02	2.80E-02	2.52E-03	1.02E-02	0.00E+00	1.27E-02	1.25E-03	5.04E-03	0.00E+00	6.29E-03
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	1.39E-02	Benthic Tissue	1.36E-02	7.64E-03	8.82E-04	2.45E-03	5.85E-06	3.34E-03	4.95E-04	1.38E-03	2.53E-06	1.87E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	8.48E-03	Benthic Tissue	1.70E+00	7.23E-01	1.80E-01	3.05E-01	1.44E-04	4.85E-01	7.67E-02	1.30E-01	1.10E-04	2.07E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	5.41E-02	Benthic Tissue	9.19E+00	6.28E+00	1.53E-01	1.65E+00	1.26E-04	1.81E+00	1.05E-01	1.13E+00	4.84E-05	1.24E+00
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	2.45E-02	Benthic Tissue	6.68E+01	2.44E+01	2.46E+00	1.20E+01	3.81E-03	1.45E+01	8.99E-01	4.40E+00	7.39E-04	5.30E+00

TABLE C.1
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	1.69E-01	Benthic Tissue	5.58E-01	2.24E-01	2.97E-03	1.00E-01	9.00E-06	1.03E-01	1.19E-03	4.04E-02	3.05E-06	4.16E-02
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	3.50E-02	Benthic Tissue	2.28E-01	7.91E-02	5.85E-03	4.10E-02	1.58E-05	4.68E-02	2.03E-03	1.42E-02	3.95E-06	1.63E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	8.48E-02	Benthic Tissue	5.00E-01	2.85E-01	5.31E-03	9.00E-02	4.07E-03	9.94E-02	3.03E-03	5.14E-02	1.90E-03	5.63E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	5.02E-02	Benthic Tissue	2.06E+00	3.00E-01	3.69E-02	3.71E-01	1.08E-05	4.08E-01	5.37E-03	5.39E-02	3.13E-06	5.93E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	8.24E-02	Benthic Tissue	1.73E+00	7.35E-01	1.89E-02	3.11E-01	8.10E-05	3.30E-01	8.03E-03	1.32E-01	6.17E-06	1.40E-01
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	1.49E-01	Benthic Tissue	9.12E+00	2.04E+00	5.49E-02	1.64E+00	3.92E-04	1.70E+00	1.23E-02	3.68E-01	4.41E-05	3.80E-01
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	7.31E-02	Benthic Tissue	4.09E+00	9.17E-01	5.04E-02	7.37E-01	3.06E-04	7.87E-01	1.13E-02	1.65E-01	3.42E-05	1.76E-01
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	4.74E-02	Benthic Tissue	2.51E+00	6.00E-01	4.77E-02	4.52E-01	3.60E-04	5.00E-01	1.14E-02	1.08E-01	4.43E-05	1.19E-01
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	2.33E-02	Benthic Tissue	4.65E-01	1.65E-01	1.80E-02	8.38E-02	4.32E-04	1.02E-01	6.40E-03	2.98E-02	5.09E-05	3.62E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	1.62E-02	0.00E+00	4.14E-04	1.66E-02	4.09E-03	0.00E+00	4.59E-05	4.14E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	1.45E-01	Benthic Tissue	9.16E+00	1.84E+00	5.67E-02	1.65E+00	4.32E-04	1.71E+00	1.14E-02	3.32E-01	4.88E-05	3.43E-01
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	1.78E-01	Benthic Tissue	1.12E+00	4.37E-01	5.67E-03	2.02E-01	4.95E-04	2.08E-01	2.21E-03	7.86E-02	5.49E-05	8.09E-02
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	3.10E-01	Benthic Tissue	4.34E+01	9.37E+00	1.26E-01	7.81E+00	2.12E-04	7.94E+00	2.72E-02	1.69E+00	1.94E-05	1.71E+00
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	2.79E-02	Benthic Tissue	1.26E-01	8.12E-02	4.05E-03	2.26E-02	6.75E-06	2.67E-02	2.62E-03	1.46E-02	2.73E-06	1.72E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	5.66E-02	Benthic Tissue	1.41E+00	3.94E-01	2.25E-02	2.55E-01	4.46E-04	2.78E-01	6.27E-03	7.10E-02	5.20E-05	7.73E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	1.75E-02	Benthic Tissue	1.26E+02	3.76E+01	6.48E+00	2.27E+01	3.02E-04	2.91E+01	1.93E+00	6.76E+00	5.72E-05	8.70E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	7.59E-02	Benthic Tissue	1.52E+00	1.11E+00	1.80E-02	2.73E-01	5.40E-05	2.91E-01	1.32E-02	2.00E-01	6.44E-06	2.13E-01
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	3.45E-01	Benthic Tissue	2.04E+01	5.41E+00	5.31E-02	3.67E+00	2.12E-04	3.72E+00	1.41E-02	9.74E-01	2.05E-05	9.88E-01
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	4.83E+01	1.18E+01	3.25E-01	8.69E+00	3.49E-03	9.02E+00	7.94E-02	2.13E+00	3.96E-04	2.21E+00
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	1.76E+02	4.98E+01	6.70E+00	3.17E+01	4.76E-03	3.84E+01	2.00E+00	8.96E+00	2.01E-03	1.10E+01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	6.35E+00	Benthic Tissue	2.92E+00	1.14E+00	4.14E-04	5.26E-01	0.00E+00	5.26E-01	1.62E-04	2.06E-01	0.00E+00	2.06E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	6.90E+00	Benthic Tissue	3.37E+00	1.83E+00	4.40E-04	6.07E-01	0.00E+00	6.08E-01	2.39E-04	3.29E-01	0.00E+00	3.30E-01
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	1.71E-05	4.14E-03	0.00E+00	4.16E-03	1.71E-05	4.14E-03	0.00E+00	4.16E-03
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	7.11E-05	1.42E-02	3.24E-03	1.75E-02	7.11E-05	1.42E-02	5.62E-04	1.49E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	4.41E-06	8.82E-04	1.80E-03	2.69E-03	4.41E-06	8.82E-04	1.17E-04	1.00E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	5.13E-05	1.03E-02	6.75E-04	1.10E-02	5.13E-05	1.03E-02	1.25E-04	1.04E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.2
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	3.87E-07	6.51E-08	0.00E+00	4.52E-07	2.38E-07	4.01E-08	0.00E+00	2.78E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	8.55E-08	4.60E-08	0.00E+00	1.32E-07	4.58E-08	2.47E-08	0.00E+00	7.05E-08
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	1.89E-08	1.34E-08	0.00E+00	3.23E-08	1.89E-08	1.34E-08	0.00E+00	3.23E-08
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	4.23E-09	9.68E-09	0.00E+00	1.39E-08	4.23E-09	9.68E-09	0.00E+00	1.39E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	3.60E-08	3.00E-07	0.00E+00	3.36E-07	3.60E-08	3.00E-07	0.00E+00	3.36E-07
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	2.70E-08	2.83E-07	0.00E+00	3.10E-07	2.70E-08	2.83E-07	0.00E+00	3.10E-07
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	9.90E-09	8.26E-08	0.00E+00	9.25E-08	9.90E-09	8.26E-08	0.00E+00	9.25E-08
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	1.80E-08	1.76E-08	0.00E+00	3.56E-08	1.80E-08	1.76E-08	0.00E+00	3.56E-08
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	3.15E-09	6.04E-08	0.00E+00	6.36E-08	3.15E-09	6.04E-08	0.00E+00	6.36E-08
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	3.51E-09	1.31E-07	0.00E+00	1.34E-07	3.51E-09	1.31E-07	0.00E+00	1.34E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	1.71E-08	9.21E-09	0.00E+00	2.63E-08	1.71E-08	9.21E-09	0.00E+00	2.63E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	4.86E-09	4.06E-08	0.00E+00	4.54E-08	4.86E-09	4.06E-08	0.00E+00	4.54E-08
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	9.90E-09	3.63E-07	0.00E+00	3.73E-07	9.90E-09	3.63E-07	0.00E+00	3.73E-07
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	1.26E-08	4.60E-07	0.00E+00	4.73E-07	6.86E-09	2.51E-07	0.00E+00	2.57E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	9.90E-06	8.33E-07	0.00E+00	1.07E-05	9.54E-06	8.03E-07	0.00E+00	1.03E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	7.74E-08	1.72E-07	0.00E+00	2.49E-07	6.49E-08	1.44E-07	0.00E+00	2.09E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	3.78E-08	1.01E-06	0.00E+00	1.05E-06	3.15E-08	8.00E-07	0.00E+00	8.31E-07
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	3.78E-08	1.01E-06	0.00E+00	1.05E-06	3.15E-08	8.00E-07	0.00E+00	8.31E-07
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	4.00E-03	Benthic Tissue	8.16E+01	8.16E+01	1.84E+01	1.47E+01	4.77E-03	3.31E+01	1.84E+01	1.47E+01	3.87E-03	3.30E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	3.15E-02	Benthic Tissue	5.35E-02	5.35E-02	1.53E-03	9.62E-03	1.35E-05	1.12E-02	1.53E-03	9.62E-03	1.14E-05	1.12E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	5.41E-02	Benthic Tissue	8.76E-01	5.79E-01	1.46E-02	1.58E-01	2.88E-04	1.73E-01	9.64E-03	1.04E-01	2.11E-04	1.14E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	1.53E-03	0.00E+00	1.71E-06	1.53E-03	1.53E-03	0.00E+00	1.71E-06	1.53E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	7.76E-03	Benthic Tissue	1.24E-02	1.05E-02	1.44E-03	2.23E-03	0.00E+00	3.67E-03	1.21E-03	1.88E-03	0.00E+00	3.10E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	4.68E-03	Benthic Tissue	1.05E+00	9.56E-01	2.03E-01	1.89E-01	6.39E-04	3.93E-01	1.84E-01	1.72E-01	5.65E-04	3.56E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	9.67E-03	Benthic Tissue	1.91E-01	1.91E-01	1.78E-02	3.45E-02	3.06E-05	5.23E-02	1.78E-02	3.45E-02	2.17E-05	5.23E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	7.75E-03	Benthic Tissue	8.14E-01	7.10E-01	9.45E-02	1.46E-01	1.17E-04	2.41E-01	8.24E-02	1.28E-01	1.06E-04	2.10E-01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	4.63E-03	Benthic Tissue	2.03E+02	1.27E+02	3.94E+01	3.65E+01	1.11E-02	7.59E+01	2.47E+01	2.29E+01	6.94E-03	4.75E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	3.62E-03	Benthic Tissue	4.39E-01	3.83E-01	1.09E-01	7.89E-02	2.07E-05	1.88E-01	9.51E-02	6.90E-02	1.58E-05	1.64E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	5.47E-03	Benthic Tissue	6.89E+00	6.89E+00	1.13E+00	1.24E+00	3.84E-03	2.38E+00	1.13E+00	1.24E+00	3.66E-03	2.38E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	1.43E-02	Benthic Tissue	5.59E-03	3.25E-03	3.51E-04	1.01E-03	1.76E-06	1.36E-03	2.04E-04	5.85E-04	1.76E-06	7.91E-04
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	1.14E-02	Benthic Tissue	4.26E-01	2.79E-01	3.37E-02	7.66E-02	2.97E-04	1.11E-01	2.21E-02	5.02E-02	2.55E-04	7.25E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	5.24E-02	Benthic Tissue	1.26E-01	1.26E-01	2.16E-03	2.27E-02	7.70E-04	2.56E-02	2.16E-03	2.27E-02	5.66E-04	2.54E-02
SILVER	--	9.40E-01	8.58E-01	--	--	2.02E-02	Benthic Tissue	1.90E-02	1.74E-02	8.46E-04	3.42E-03	0.00E+00	4.27E-03	7.72E-04	3.12E-03	0.00E+00	3.90E-03
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	1.39E-02	Benthic Tissue	3.89E-03	3.89E-03	2.52E-04	7.00E-04	4.50E-06	9.57E-04	2.52E-04	7.00E-04	4.10E-06	9.56E-04
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	8.48E-03	Benthic Tissue	3.26E-01	3.26E-01	3.47E-02	5.88E-02	1.67E-04	9.36E-02	3.47E-02	5.88E-02	1.67E-04	9.36E-02
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	5.41E-02	Benthic Tissue	5.11E+00	5.11E+00	8.50E-02	9.19E-01	9.45E-05	1.00E+00	8.50E-02	9.19E-01	6.86E-05	1.00E+00
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	2.45E-02	Benthic Tissue	1.05E+01	9.20E+00	3.86E-01	1.89E+00	4.05E-04	2.28E+00	3.38E-01	1.66E+00	2.99E-04	1.99E+00

TABLE C.2
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	1.69E-01	Benthic Tissue	5.58E-02	5.58E-02	2.97E-04	1.00E-02	3.02E-06	1.03E-02	2.97E-04	1.00E-02	3.02E-06	1.03E-02
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	3.50E-02	Benthic Tissue	2.21E-02	2.01E-02	5.67E-04	3.97E-03	6.75E-06	4.54E-03	5.17E-04	3.62E-03	5.54E-06	4.14E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	8.48E-02	Benthic Tissue	3.73E-02	3.73E-02	3.96E-04	6.71E-03	4.77E-03	1.19E-02	3.96E-04	6.71E-03	3.87E-03	1.10E-02
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	5.02E-02	Benthic Tissue	1.91E-02	1.91E-02	3.42E-04	3.44E-03	0.00E+00	3.78E-03	3.42E-04	3.44E-03	0.00E+00	3.78E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	8.24E-02	Benthic Tissue	5.35E-02	4.88E-02	5.85E-04	9.64E-03	1.08E-06	1.02E-02	5.33E-04	8.78E-03	1.08E-06	9.31E-03
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	1.49E-01	Benthic Tissue	1.79E-01	1.79E-01	1.08E-03	3.23E-02	6.30E-06	3.34E-02	1.08E-03	3.23E-02	6.30E-06	3.34E-02
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	7.31E-02	Benthic Tissue	8.04E-02	8.04E-02	9.90E-04	1.45E-02	2.30E-06	1.55E-02	9.90E-04	1.45E-02	2.30E-06	1.55E-02
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	4.74E-02	Benthic Tissue	9.00E-02	9.00E-02	1.71E-03	1.62E-02	2.21E-06	1.79E-02	1.71E-03	1.62E-02	2.21E-06	1.79E-02
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	2.33E-02	Benthic Tissue	1.93E-02	1.93E-02	7.47E-04	3.48E-03	3.33E-06	4.23E-03	7.47E-04	3.48E-03	3.33E-06	4.23E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	2.43E-05	0.00E+00	3.11E-06	2.74E-05	2.43E-05	0.00E+00	3.11E-06	2.74E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	1.45E-01	Benthic Tissue	1.45E-01	1.45E-01	9.00E-04	2.62E-02	4.95E-06	2.71E-02	9.00E-04	2.62E-02	4.95E-06	2.71E-02
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	1.78E-01	Benthic Tissue	4.62E-02	2.65E-02	2.34E-04	8.32E-03	3.29E-06	8.56E-03	1.34E-04	4.77E-03	3.29E-06	4.91E-03
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	3.10E-01	Benthic Tissue	6.82E-01	6.82E-01	1.98E-03	1.23E-01	2.52E-05	1.25E-01	1.98E-03	1.23E-01	2.20E-05	1.25E-01
FLUORENE	Low	6.30E-01	3.22E-01	--	--	2.79E-02	Benthic Tissue	1.76E-02	8.99E-03	5.67E-04	3.17E-03	0.00E+00	3.73E-03	2.90E-04	1.62E-03	0.00E+00	1.91E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	5.66E-02	Benthic Tissue	4.92E-02	4.92E-02	7.83E-04	8.86E-03	3.29E-06	9.65E-03	7.83E-04	8.86E-03	3.29E-06	9.65E-03
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	1.75E-02	Benthic Tissue	1.45E-01	1.45E-01	7.47E-03	2.61E-02	1.62E-05	3.36E-02	7.47E-03	2.61E-02	7.79E-06	3.36E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	7.59E-02	Benthic Tissue	1.52E-01	1.52E-01	1.80E-03	2.73E-02	5.85E-06	2.91E-02	1.80E-03	2.73E-02	5.13E-06	2.91E-02
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	3.45E-01	Benthic Tissue	4.84E-01	4.84E-01	1.26E-03	8.70E-02	1.40E-05	8.83E-02	1.26E-03	8.70E-02	1.40E-05	8.83E-02
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	--	Benthic Tissue	NA	NA	7.73E-03	1.97E-01	4.27E-05	2.05E-01	7.63E-03	1.93E-01	4.27E-05	2.01E-01
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	--	Benthic Tissue	NA	NA	7.73E-03	1.97E-01	4.27E-05	2.05E-01	7.63E-03	1.93E-01	4.27E-05	2.01E-01
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	--	Benthic Tissue	NA	NA	1.40E-02	2.13E-01	4.83E-03	2.32E-01	1.36E-02	2.10E-01	3.91E-03	2.28E-01
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	--	Benthic Tissue	NA	NA	1.40E-02	2.13E-01	4.83E-03	2.32E-01	1.36E-02	2.10E-01	3.91E-03	2.28E-01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	6.35E+00	Benthic Tissue	2.75E-01	2.50E-01	3.91E-05	4.96E-02	0.00E+00	4.96E-02	3.55E-05	4.50E-02	0.00E+00	4.50E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	6.90E+00	Benthic Tissue	4.02E-01	3.67E-01	5.25E-05	7.24E-02	0.00E+00	7.25E-02	4.79E-05	6.61E-02	0.00E+00	6.62E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.3
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	2.07E-06	3.48E-07	0.00E+00	2.42E-06	3.85E-07	6.48E-08	0.00E+00	4.50E-07
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	1.89E-07	1.02E-07	0.00E+00	2.91E-07	5.78E-08	3.11E-08	0.00E+00	8.89E-08
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	1.80E-08	1.27E-08	0.00E+00	3.07E-08	8.84E-09	6.25E-09	0.00E+00	1.51E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	7.20E-09	1.65E-08	0.00E+00	2.37E-08	2.80E-09	6.40E-09	0.00E+00	9.20E-09
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	3.24E-08	2.70E-07	0.00E+00	3.03E-07	1.36E-08	1.13E-07	0.00E+00	1.27E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	6.21E-08	6.50E-07	0.00E+00	7.13E-07	1.94E-08	2.03E-07	0.00E+00	2.22E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	1.17E-08	9.76E-08	0.00E+00	1.09E-07	6.99E-09	5.83E-08	0.00E+00	6.53E-08
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	3.24E-08	3.16E-08	0.00E+00	6.40E-08	1.09E-08	1.07E-08	0.00E+00	2.16E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	1.26E-09	2.42E-08	0.00E+00	2.54E-08	9.23E-10	1.77E-08	0.00E+00	1.86E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	9.90E-09	3.68E-07	0.00E+00	3.78E-07	3.49E-09	1.30E-07	0.00E+00	1.33E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	1.17E-08	6.30E-09	0.00E+00	1.80E-08	6.45E-09	3.48E-09	0.00E+00	9.93E-09
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	1.08E-08	9.01E-08	0.00E+00	1.01E-07	5.24E-09	4.37E-08	0.00E+00	4.90E-08
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	1.26E-08	4.63E-07	0.00E+00	4.75E-07	6.99E-09	2.57E-07	0.00E+00	2.64E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	3.87E-09	1.82E-07	0.00E+00	1.86E-07	1.55E-09	7.29E-08	0.00E+00	7.44E-08
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	2.61E-08	9.54E-07	0.00E+00	9.80E-07	1.05E-08	3.82E-07	0.00E+00	3.92E-07
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	2.97E-05	2.50E-06	0.00E+00	3.22E-05	5.98E-06	5.03E-07	0.00E+00	6.48E-06
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	7.92E-07	1.76E-06	0.00E+00	2.55E-06	2.40E-07	5.33E-07	0.00E+00	7.74E-07
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	7.07E-08	2.03E-06	0.00E+00	2.10E-06	2.89E-08	8.69E-07	0.00E+00	8.98E-07
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	7.56E-02	1.51E+01	0.00E+00	1.52E+01	3.03E-02	6.06E+00	0.00E+00	6.09E+00
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Crab Tissue	7.20E+00	6.46E+00	2.26E+01	1.30E+00	4.07E-03	2.39E+01	2.00E+01	1.16E+00	1.90E-03	2.11E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Crab Tissue	3.91E-02	3.39E-02	2.97E-03	7.04E-03	1.44E-05	1.00E-02	1.28E-03	6.10E-03	9.41E-06	7.39E-03
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Crab Tissue	1.24E+00	1.22E+00	6.48E-02	2.24E-01	3.42E-04	2.89E-01	2.49E-02	2.19E-01	1.97E-04	2.44E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Crab Tissue	--	--	1.98E-03	0.00E+00	2.12E-06	1.98E-03	1.49E-03	0.00E+00	2.12E-06	1.50E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	--	Crab Tissue	1.58E-01	1.51E-01	6.93E-03	2.85E-02	0.00E+00	3.54E-02	2.67E-03	2.71E-02	0.00E+00	2.98E-02
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Crab Tissue	2.12E-01	1.96E-01	4.54E-01	3.81E-02	2.21E-04	4.92E-01	2.13E-01	3.52E-02	1.67E-04	2.48E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Crab Tissue	1.38E-01	1.26E-01	4.77E-02	2.49E-02	2.34E-05	7.26E-02	2.64E-02	2.26E-02	1.77E-05	4.91E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Crab Tissue	1.25E+01	1.07E+01	5.36E-01	2.25E+00	1.31E-04	2.78E+00	1.55E-01	1.93E+00	1.05E-04	2.09E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Crab Tissue	5.01E+01	4.47E+01	1.08E+02	9.02E+00	9.54E-03	1.17E+02	6.87E+01	8.05E+00	4.67E-03	7.68E+01
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Crab Tissue	1.71E-01	1.51E-01	1.15E+00	3.08E-02	2.52E-05	1.18E+00	3.15E-01	2.71E-02	8.69E-06	3.43E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Crab Tissue	1.10E+01	8.76E+00	1.43E+00	1.99E+00	8.91E-03	3.43E+00	1.14E+00	1.58E+00	3.15E-03	2.72E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Crab Tissue	2.10E-02	1.91E-02	1.53E-03	3.78E-03	2.84E-06	5.31E-03	6.17E-04	3.44E-03	2.58E-06	4.06E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Crab Tissue	1.95E-01	1.88E-01	5.08E-02	3.51E-02	3.56E-04	8.62E-02	3.84E-02	3.39E-02	2.86E-04	7.26E-02
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Crab Tissue	1.07E+00	1.00E+00	1.11E-02	1.93E-01	1.10E-03	2.06E-01	4.15E-03	1.80E-01	6.06E-04	1.85E-01
SILVER	--	2.80E+00	1.39E+00	--	--	--	Crab Tissue	3.61E-01	3.27E-01	2.52E-03	6.50E-02	0.00E+00	6.76E-02	1.25E-03	5.89E-02	0.00E+00	6.01E-02
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Crab Tissue	1.29E-03	1.29E-03	8.82E-04	2.32E-04	5.85E-06	1.12E-03	4.95E-04	2.32E-04	2.53E-06	7.29E-04
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Crab Tissue	4.67E-02	4.67E-02	1.80E-01	8.40E-03	1.44E-04	1.89E-01	7.67E-02	8.40E-03	1.10E-04	8.52E-02
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Crab Tissue	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.26E-04	1.53E-01	1.05E-01	0.00E+00	4.84E-05	1.05E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Crab Tissue	4.59E+01	4.59E+01	2.46E+00	8.26E+00	3.81E-03	1.07E+01	8.99E-01	8.26E+00	7.39E-04	9.16E+00

TABLE C.3
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Crab Tissue	--	--	2.97E-03	0.00E+00	9.00E-06	2.98E-03	1.19E-03	0.00E+00	3.05E-06	1.20E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Crab Tissue	2.80E-03	2.80E-03	5.85E-03	5.04E-04	1.58E-05	6.37E-03	2.03E-03	5.04E-04	3.95E-06	2.54E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Crab Tissue	1.19E-02	1.19E-02	5.31E-03	2.13E-03	4.07E-03	1.15E-02	3.03E-03	2.13E-03	1.90E-03	7.07E-03
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Crab Tissue	6.69E-03	6.69E-03	3.69E-02	1.20E-03	1.08E-05	3.81E-02	5.37E-03	1.20E-03	3.13E-06	6.57E-03
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Crab Tissue	1.01E-02	1.01E-02	1.89E-02	1.82E-03	8.10E-05	2.08E-02	8.03E-03	1.82E-03	6.17E-06	9.86E-03
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Crab Tissue	--	--	5.49E-02	0.00E+00	3.92E-04	5.53E-02	1.23E-02	0.00E+00	4.41E-05	1.23E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Crab Tissue	4.85E-03	4.85E-03	5.04E-02	8.74E-04	3.06E-04	5.16E-02	1.13E-02	8.74E-04	3.42E-05	1.22E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Crab Tissue	3.15E-02	2.77E-02	4.77E-02	5.66E-03	3.60E-04	5.37E-02	1.14E-02	4.98E-03	4.43E-05	1.64E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Crab Tissue	--	--	1.80E-02	0.00E+00	4.32E-04	1.84E-02	6.40E-03	0.00E+00	5.09E-05	6.45E-03
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Crab Tissue	3.92E-03	3.92E-03	1.62E-02	7.06E-04	4.14E-04	1.73E-02	4.09E-03	7.06E-04	4.59E-05	4.84E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Crab Tissue	8.95E-03	8.95E-03	5.67E-02	1.61E-03	4.32E-04	5.87E-02	1.14E-02	1.61E-03	4.88E-05	1.31E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Crab Tissue	--	--	5.67E-03	0.00E+00	4.95E-04	6.17E-03	2.21E-03	0.00E+00	5.49E-05	2.27E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Crab Tissue	8.69E-02	7.79E-02	1.26E-01	1.57E-02	2.12E-04	1.42E-01	2.72E-02	1.40E-02	1.94E-05	4.12E-02
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	--	Crab Tissue	1.75E-03	1.75E-03	4.05E-03	3.16E-04	6.75E-06	4.37E-03	2.62E-03	3.16E-04	2.73E-06	2.93E-03
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Crab Tissue	--	--	2.25E-02	0.00E+00	4.46E-04	2.29E-02	6.27E-03	0.00E+00	5.20E-05	6.32E-03
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Crab Tissue	1.60E-02	1.60E-02	6.48E+00	2.88E-03	3.02E-04	6.48E+00	1.93E+00	2.88E-03	5.72E-05	1.94E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Crab Tissue	1.60E-02	1.60E-02	1.80E-02	2.88E-03	5.40E-05	2.09E-02	1.32E-02	2.88E-03	6.44E-06	1.61E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Crab Tissue	4.74E-02	4.13E-02	5.31E-02	8.53E-03	2.12E-04	6.18E-02	1.41E-02	7.43E-03	2.05E-05	2.16E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	9.65E-02	8.67E-02	3.25E-01	1.74E-02	3.49E-03	3.46E-01	7.94E-02	1.56E-02	3.96E-04	9.55E-02
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	1.52E-01	1.43E-01	6.70E+00	2.74E-02	4.76E-03	6.73E+00	2.00E+00	2.58E-02	2.01E-03	2.02E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Crab Tissue	1.44E-01	1.37E-01	4.14E-04	2.60E-02	0.00E+00	2.64E-02	1.62E-04	2.47E-02	0.00E+00	2.48E-02
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Crab Tissue	2.10E-01	1.99E-01	4.40E-04	3.77E-02	0.00E+00	3.82E-02	2.39E-04	3.58E-02	0.00E+00	3.61E-02
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	1.71E-05	4.14E-03	0.00E+00	4.16E-03	1.71E-05	4.14E-03	0.00E+00	4.16E-03
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	7.11E-05	1.42E-02	3.24E-03	1.75E-02	7.11E-05	1.42E-02	5.62E-04	1.49E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	4.41E-06	8.82E-04	1.80E-03	2.69E-03	4.41E-06	8.82E-04	1.17E-04	1.00E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	5.13E-05	1.03E-02	6.75E-04	1.10E-02	5.13E-05	1.03E-02	1.25E-04	1.04E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.4
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	3.87E-07	6.51E-08	0.00E+00	4.52E-07	2.38E-07	4.01E-08	0.00E+00	2.78E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	8.55E-08	4.60E-08	0.00E+00	1.32E-07	4.58E-08	2.47E-08	0.00E+00	7.05E-08
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	1.89E-08	1.34E-08	0.00E+00	3.23E-08	1.89E-08	1.34E-08	0.00E+00	3.23E-08
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	4.23E-09	9.68E-09	0.00E+00	1.39E-08	4.23E-09	9.68E-09	0.00E+00	1.39E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	3.60E-08	3.00E-07	0.00E+00	3.36E-07	3.60E-08	3.00E-07	0.00E+00	3.36E-07
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	2.70E-08	2.83E-07	0.00E+00	3.10E-07	2.70E-08	2.83E-07	0.00E+00	3.10E-07
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	9.90E-09	8.26E-08	0.00E+00	9.25E-08	9.90E-09	8.26E-08	0.00E+00	9.25E-08
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	1.80E-08	1.76E-08	0.00E+00	3.56E-08	1.80E-08	1.76E-08	0.00E+00	3.56E-08
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	3.15E-09	6.04E-08	0.00E+00	6.36E-08	3.15E-09	6.04E-08	0.00E+00	6.36E-08
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	3.51E-09	1.31E-07	0.00E+00	1.34E-07	3.51E-09	1.31E-07	0.00E+00	1.34E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	1.71E-08	9.21E-09	0.00E+00	2.63E-08	1.71E-08	9.21E-09	0.00E+00	2.63E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	4.86E-09	4.06E-08	0.00E+00	4.54E-08	4.86E-09	4.06E-08	0.00E+00	4.54E-08
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	9.90E-09	3.63E-07	0.00E+00	3.73E-07	9.90E-09	3.63E-07	0.00E+00	3.73E-07
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	1.26E-08	4.60E-07	0.00E+00	4.73E-07	6.86E-09	2.51E-07	0.00E+00	2.57E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	9.90E-06	8.33E-07	0.00E+00	1.07E-05	9.54E-06	8.03E-07	0.00E+00	1.03E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	7.74E-08	1.72E-07	0.00E+00	2.49E-07	6.49E-08	1.44E-07	0.00E+00	2.09E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	3.78E-08	1.01E-06	0.00E+00	1.05E-06	3.15E-08	8.00E-07	0.00E+00	8.31E-07
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	3.78E-08	1.01E-06	0.00E+00	1.05E-06	3.15E-08	8.00E-07	0.00E+00	8.31E-07
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	--	Crab Tissue	4.18E+00	3.85E+00	1.84E+01	7.52E-01	4.77E-03	1.91E+01	1.84E+01	6.93E-01	3.87E-03	1.91E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	--	Crab Tissue	4.93E-02	4.01E-02	1.53E-03	8.88E-03	1.35E-05	1.04E-02	1.53E-03	7.22E-03	1.14E-05	8.76E-03
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	--	Crab Tissue	1.26E+00	1.26E+00	1.46E-02	2.26E-01	2.88E-04	2.41E-01	9.64E-03	2.27E-01	2.11E-04	2.37E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	--	Crab Tissue	--	--	1.53E-03	0.00E+00	1.71E-06	1.53E-03	1.53E-03	0.00E+00	1.71E-06	1.53E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	--	Crab Tissue	2.21E-01	1.85E-01	1.44E-03	3.98E-02	0.00E+00	4.13E-02	1.21E-03	3.32E-02	0.00E+00	3.45E-02
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	--	Crab Tissue	1.25E-01	1.22E-01	2.03E-01	2.25E-02	6.39E-04	2.26E-01	1.84E-01	2.19E-02	5.65E-04	2.06E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	--	Crab Tissue	1.41E-01	1.23E-01	1.78E-02	2.54E-02	3.06E-05	4.33E-02	1.78E-02	2.21E-02	2.17E-05	4.00E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	--	Crab Tissue	1.62E+01	1.44E+01	9.45E-02	2.92E+00	1.17E-04	3.02E+00	8.24E-02	2.59E+00	1.06E-04	2.67E+00
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	--	Crab Tissue	2.13E+01	2.11E+01	3.94E+01	3.84E+00	1.11E-02	4.33E+01	2.47E+01	3.80E+00	6.94E-03	2.85E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	--	Crab Tissue	4.39E-02	4.30E-02	1.09E-01	7.90E-03	2.07E-05	1.17E-01	9.51E-02	7.74E-03	1.58E-05	1.03E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	--	Crab Tissue	6.07E+00	5.38E+00	1.13E+00	1.09E+00	3.84E-03	2.23E+00	1.13E+00	9.69E-01	3.66E-03	2.11E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	--	Crab Tissue	2.66E-02	2.36E-02	3.51E-04	4.80E-03	1.76E-06	5.15E-03	2.04E-04	4.26E-03	1.76E-06	4.46E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	--	Crab Tissue	2.29E-01	2.12E-01	3.37E-02	4.13E-02	2.97E-04	7.52E-02	2.21E-02	3.82E-02	2.55E-04	6.06E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	--	Crab Tissue	1.13E+00	1.10E+00	2.16E-03	2.04E-01	7.70E-04	2.06E-01	2.16E-03	1.99E-01	5.66E-04	2.02E-01
SILVER	--	9.40E-01	8.58E-01	--	--	--	Crab Tissue	3.69E-01	3.15E-01	8.46E-04	6.64E-02	0.00E+00	6.73E-02	7.72E-04	5.67E-02	0.00E+00	5.75E-02
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	--	Crab Tissue	8.52E-03	8.52E-03	2.52E-04	1.53E-03	4.50E-06	1.79E-03	2.52E-04	1.53E-03	4.10E-06	1.79E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	--	Crab Tissue	2.72E-01	2.53E-01	3.47E-02	4.90E-02	1.67E-04	8.38E-02	3.47E-02	4.56E-02	1.67E-04	8.04E-02
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	--	Crab Tissue	0.00E+00	0.00E+00	8.50E-02	0.00E+00	9.45E-05	8.51E-02	8.50E-02	0.00E+00	6.86E-05	8.50E-02
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	--	Crab Tissue	4.76E+01	4.69E+01	3.86E-01	8.57E+00	4.05E-04	8.96E+00	3.38E-01	8.45E+00	2.99E-04	8.78E+00

TABLE C.4
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	--	Crab Tissue	5.23E-04	5.23E-04	2.97E-04	9.41E-05	3.02E-06	3.94E-04	2.97E-04	9.41E-05	3.02E-06	3.94E-04
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	--	Crab Tissue	--	--	5.67E-04	0.00E+00	6.75E-06	5.74E-04	5.17E-04	0.00E+00	5.54E-06	5.22E-04
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	--	Crab Tissue	1.46E-03	1.46E-03	3.96E-04	2.62E-04	4.77E-03	5.43E-03	3.96E-04	2.62E-04	3.87E-03	4.52E-03
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	--	Crab Tissue	--	--	3.42E-04	0.00E+00	0.00E+00	3.42E-04	3.42E-04	0.00E+00	0.00E+00	3.42E-04
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	--	Crab Tissue	--	--	5.85E-04	0.00E+00	1.08E-06	5.86E-04	5.33E-04	0.00E+00	1.08E-06	5.34E-04
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	--	Crab Tissue	--	--	1.08E-03	0.00E+00	6.30E-06	1.09E-03	1.08E-03	0.00E+00	6.30E-06	1.09E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	--	Crab Tissue	--	--	9.90E-04	0.00E+00	2.30E-06	9.92E-04	9.90E-04	0.00E+00	2.30E-06	9.92E-04
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	--	Crab Tissue	--	--	1.71E-03	0.00E+00	2.21E-06	1.71E-03	1.71E-03	0.00E+00	2.21E-06	1.71E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	--	Crab Tissue	4.15E-03	4.15E-03	7.47E-04	7.47E-04	3.33E-06	1.50E-03	7.47E-04	7.47E-04	3.33E-06	1.50E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	--	Crab Tissue	--	--	2.43E-05	0.00E+00	3.11E-06	2.74E-05	2.43E-05	0.00E+00	3.11E-06	2.74E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	--	Crab Tissue	--	--	9.00E-04	0.00E+00	4.95E-06	9.05E-04	9.00E-04	0.00E+00	4.95E-06	9.05E-04
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	2.34E-04	0.00E+00	3.29E-06	2.37E-04	1.34E-04	0.00E+00	3.29E-06	1.37E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	--	Crab Tissue	--	--	1.98E-03	0.00E+00	2.52E-05	2.01E-03	1.98E-03	0.00E+00	2.20E-05	2.00E-03
FLUORENE	Low	6.30E-01	3.22E-01	--	--	--	Crab Tissue	--	--	5.67E-04	0.00E+00	0.00E+00	5.67E-04	2.90E-04	0.00E+00	0.00E+00	2.90E-04
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	7.83E-04	0.00E+00	3.29E-06	7.86E-04	7.83E-04	0.00E+00	3.29E-06	7.86E-04
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	--	Crab Tissue	8.96E-04	8.96E-04	7.47E-03	1.61E-04	1.62E-05	7.65E-03	7.47E-03	1.61E-04	7.79E-06	7.64E-03
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	--	Crab Tissue	4.55E-03	4.55E-03	1.80E-03	8.20E-04	5.85E-06	2.63E-03	1.80E-03	8.20E-04	5.13E-06	2.62E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	--	Crab Tissue	--	--	1.26E-03	0.00E+00	1.40E-05	1.27E-03	1.26E-03	0.00E+00	1.40E-05	1.27E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	--	NA[B]	NA[B]	NA[B]	7.73E-03	7.47E-04	4.27E-05	8.52E-03	7.63E-03	7.47E-04	4.27E-05	8.42E-03
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	--	NA[B]	NA[B]	NA[B]	7.73E-03	7.47E-04	4.27E-05	8.52E-03	7.63E-03	7.47E-04	4.27E-05	8.42E-03
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	--	NA[B]	NA[B]	NA[B]	1.40E-02	1.34E-03	4.83E-03	2.02E-02	1.36E-02	1.34E-03	3.91E-03	1.89E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	--	NA[B]	NA[B]	NA[B]	1.40E-02	1.34E-03	4.83E-03	2.02E-02	1.36E-02	1.34E-03	3.91E-03	1.89E-02
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	--	Crab Tissue	2.22E-01	2.08E-01	3.91E-05	4.00E-02	0.00E+00	4.00E-02	3.55E-05	3.74E-02	0.00E+00	3.75E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	--	Crab Tissue	2.84E-01	2.72E-01	5.25E-05	5.11E-02	0.00E+00	5.12E-02	4.79E-05	4.90E-02	0.00E+00	4.90E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.5
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Fish Tissue	3.22E+01	2.95E+01	2.26E+01	5.80E+00	4.07E-03	2.84E+01	2.00E+01	5.30E+00	1.90E-03	2.53E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Fish Tissue	8.30E-02	5.96E-02	2.97E-03	1.49E-02	1.44E-05	1.79E-02	1.28E-03	1.07E-02	9.41E-06	1.20E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Fish Tissue	7.00E-01	6.66E-01	6.48E-02	1.26E-01	3.42E-04	1.91E-01	2.49E-02	1.20E-01	1.97E-04	1.45E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Fish Tissue	--	--	1.98E-03	0.00E+00	2.12E-06	1.98E-03	1.49E-03	0.00E+00	2.12E-06	1.50E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Fish Tissue	3.60E-01	3.01E-01	4.54E-01	6.48E-02	2.21E-04	5.19E-01	2.13E-01	5.42E-02	1.67E-04	2.67E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Fish Tissue	1.10E-01	9.89E-02	4.77E-02	1.98E-02	2.34E-05	6.75E-02	2.64E-02	1.78E-02	1.77E-05	4.42E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Fish Tissue	3.41E+01	3.05E+01	5.36E-01	6.14E+00	1.31E-04	6.67E+00	1.55E-01	5.49E+00	1.05E-04	5.64E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Fish Tissue	1.42E+02	1.32E+02	1.08E+02	2.56E+01	9.54E-03	1.34E+02	6.87E+01	2.37E+01	4.67E-03	9.24E+01
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Fish Tissue	7.80E-01	7.74E-01	1.15E+00	1.40E-01	2.52E-05	1.29E+00	3.15E-01	1.39E-01	8.69E-06	4.55E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Fish Tissue	1.47E+01	1.42E+01	1.43E+00	2.65E+00	8.91E-03	4.09E+00	1.14E+00	2.56E+00	3.15E-03	3.71E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Fish Tissue	3.40E-02	3.40E-02	1.53E-03	6.12E-03	2.84E-06	7.65E-03	6.17E-04	6.12E-03	2.58E-06	6.74E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Fish Tissue	1.50E-01	1.36E-01	5.08E-02	2.70E-02	3.56E-04	7.81E-02	3.84E-02	2.45E-02	2.86E-04	6.32E-02
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Fish Tissue	1.80E+00	1.70E+00	1.11E-02	3.24E-01	1.10E-03	3.36E-01	4.15E-03	3.07E-01	6.06E-04	3.12E-01
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Fish Tissue	9.50E-03	9.50E-03	8.82E-04	1.71E-03	5.85E-06	2.60E-03	4.95E-04	1.71E-03	2.53E-06	2.21E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Fish Tissue	2.80E-01	2.73E-01	1.80E-01	5.04E-02	1.44E-04	2.31E-01	7.67E-02	4.91E-02	1.10E-04	1.26E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Fish Tissue	0.00E+00	0.00E+00	1.53E-01	0.00E+00	1.26E-04	1.53E-01	1.05E-01	0.00E+00	4.84E-05	1.05E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Fish Tissue	3.21E+01	3.11E+01	2.46E+00	5.78E+00	3.81E-03	8.24E+00	8.99E-01	5.60E+00	7.39E-04	6.50E+00
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Fish Tissue	--	--	2.97E-03	0.00E+00	9.00E-06	2.98E-03	1.19E-03	0.00E+00	3.05E-06	1.20E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Fish Tissue	5.00E-03	5.00E-03	5.85E-03	9.00E-04	1.58E-05	6.77E-03	2.03E-03	9.00E-04	3.95E-06	2.94E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Fish Tissue	1.10E-02	9.68E-03	5.31E-03	1.98E-03	4.07E-03	1.14E-02	3.03E-03	1.74E-03	1.90E-03	6.68E-03
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Fish Tissue	9.00E-03	8.80E-03	3.69E-02	1.62E-03	1.08E-05	3.85E-02	5.37E-03	1.58E-03	3.13E-06	6.96E-03
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Fish Tissue	--	--	1.89E-02	0.00E+00	8.10E-05	1.90E-02	8.03E-03	0.00E+00	6.17E-06	8.04E-03
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Fish Tissue	--	--	5.49E-02	0.00E+00	3.92E-04	5.53E-02	1.23E-02	0.00E+00	4.41E-05	1.23E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Fish Tissue	--	--	5.04E-02	0.00E+00	3.06E-04	5.07E-02	1.13E-02	0.00E+00	3.42E-05	1.13E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Fish Tissue	--	--	4.77E-02	0.00E+00	3.60E-04	4.81E-02	1.14E-02	0.00E+00	4.43E-05	1.14E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Fish Tissue	8.40E-04	8.40E-04	1.80E-02	1.51E-04	4.32E-04	1.86E-02	6.40E-03	1.51E-04	5.09E-05	6.60E-03
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Fish Tissue	--	--	1.62E-02	0.00E+00	4.14E-04	1.66E-02	4.09E-03	0.00E+00	4.59E-05	4.14E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Fish Tissue	--	--	5.67E-02	0.00E+00	4.32E-04	5.71E-02	1.14E-02	0.00E+00	4.88E-05	1.15E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Fish Tissue	--	--	5.67E-03	0.00E+00	4.95E-04	6.17E-03	2.21E-03	0.00E+00	5.49E-05	2.27E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Fish Tissue	5.90E-02	5.10E-02	1.26E-01	1.06E-02	2.12E-04	1.37E-01	2.72E-02	9.18E-03	1.94E-05	3.64E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Fish Tissue	3.20E-03	3.20E-03	2.25E-02	5.76E-04	4.46E-04	2.35E-02	6.27E-03	5.76E-04	5.20E-05	6.90E-03
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Fish Tissue	1.90E-02	1.82E-02	6.48E+00	3.42E-03	3.02E-04	6.48E+00	1.93E+00	3.28E-03	5.72E-05	1.94E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Fish Tissue	1.00E-02	9.69E-03	1.80E-02	1.80E-03	5.40E-05	1.99E-02	1.32E-02	1.74E-03	6.44E-06	1.49E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Fish Tissue	5.40E-03	5.40E-03	5.31E-02	9.72E-04	2.12E-04	5.43E-02	1.41E-02	9.72E-04	2.05E-05	1.51E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	3.25E-01	1.70E-03	3.49E-03	3.30E-01	7.94E-02	1.70E-03	3.96E-04	8.15E-02
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	6.69E+00	2.03E-02	4.75E-03	6.72E+00	1.99E+00	1.84E-02	2.00E-03	2.01E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Fish Tissue	5.37E-01	5.20E-01	4.14E-04	9.66E-02	0.00E+00	9.70E-02	1.62E-04	9.36E-02	0.00E+00	9.38E-02
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Fish Tissue	5.57E-01	5.40E-01	4.40E-04	1.00E-01	0.00E+00	1.01E-01	2.39E-04	9.72E-02	0.00E+00	9.75E-02

TABLE C.5
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg dry wt./kg bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
VOLATILES																	
1,2-DICHLOROBENZENE	--	--	--	2.90E-03	2.90E-03	8.51E+01	SWBAF	2.47E-01	2.47E-01	0.00E+00	4.44E-02	1.31E-04	4.46E-02	0.00E+00	4.44E-02	1.31E-04	4.46E-02
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.18E+01	SWBAF	8.50E-01	1.47E-01	7.11E-05	1.53E-01	3.24E-03	1.56E-01	7.11E-05	2.65E-02	5.62E-04	2.71E-02
CHLOROFORM	--	--	--	1.00E-03	1.00E-03	9.26E+00	SWBAF	9.26E-03	9.26E-03	0.00E+00	1.67E-03	4.50E-05	1.71E-03	0.00E+00	1.67E-03	4.50E-05	1.71E-03
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	5.56E+01	SWBAF	2.22E+00	1.44E-01	4.41E-06	4.00E-01	1.80E-03	4.02E-01	4.41E-06	2.60E-02	1.17E-04	2.61E-02
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	2.94E+01	SWBAF	4.41E-01	8.20E-02	5.13E-05	7.94E-02	6.75E-04	8.01E-02	5.13E-05	1.48E-02	1.25E-04	1.49E-02
TOTAL XYLENES	--	--	--	6.50E-03	4.44E-03	5.32E+01	SWBAF	3.46E-01	2.36E-01	0.00E+00	6.22E-02	2.93E-04	6.25E-02	0.00E+00	4.25E-02	2.00E-04	4.27E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.6
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (GREAT BLUE HERON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	9.00E-04	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	1.80E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	4.50E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Fish) Uptake			Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	Fish Tissue	8.36E+01	6.93E+01	1.84E+01	1.50E+01	4.77E-03	3.34E+01	1.84E+01	1.25E+01	3.87E-03	3.08E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	Fish Tissue	6.90E-02	5.27E-02	1.53E-03	1.24E-02	1.35E-05	1.40E-02	1.53E-03	9.48E-03	1.14E-05	1.10E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	Fish Tissue	8.10E-01	8.02E-01	1.46E-02	1.46E-01	2.88E-04	1.61E-01	9.64E-03	1.44E-01	2.11E-04	1.54E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	Fish Tissue	--	--	1.53E-03	0.00E+00	1.71E-06	1.53E-03	1.53E-03	0.00E+00	1.71E-06	1.53E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	Fish Tissue	6.80E-01	6.80E-01	2.03E-01	1.22E-01	6.39E-04	3.26E-01	1.84E-01	1.22E-01	5.65E-04	3.07E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	Fish Tissue	1.10E-01	1.07E-01	1.78E-02	1.98E-02	3.06E-05	3.77E-02	1.78E-02	1.92E-02	2.17E-05	3.70E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	Fish Tissue	2.57E+01	2.30E+01	9.45E-02	4.63E+00	1.17E-04	4.72E+00	8.24E-02	4.14E+00	1.06E-04	4.23E+00
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	Fish Tissue	1.26E+02	1.08E+02	3.94E+01	2.27E+01	1.11E-02	6.21E+01	2.47E+01	1.94E+01	6.94E-03	4.41E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	Fish Tissue	4.10E-01	3.82E-01	1.09E-01	7.38E-02	2.07E-05	1.83E-01	9.51E-02	6.88E-02	1.58E-05	1.64E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	Fish Tissue	2.38E+01	2.04E+01	1.13E+00	4.28E+00	3.84E-03	5.42E+00	1.13E+00	3.67E+00	3.66E-03	4.81E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	Fish Tissue	4.50E-02	3.82E-02	3.51E-04	8.10E-03	1.76E-06	8.45E-03	2.04E-04	6.88E-03	1.76E-06	7.08E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	Fish Tissue	2.40E-01	2.25E-01	3.37E-02	4.32E-02	2.97E-04	7.72E-02	2.21E-02	4.05E-02	2.55E-04	6.28E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	Fish Tissue	1.40E+00	1.35E+00	2.16E-03	2.52E-01	7.70E-04	2.55E-01	2.16E-03	2.42E-01	5.66E-04	2.45E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	Fish Tissue	--	--	2.52E-04	0.00E+00	4.50E-06	2.57E-04	2.52E-04	0.00E+00	4.10E-06	2.56E-04
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	Fish Tissue	2.90E-01	2.86E-01	3.47E-02	5.22E-02	1.67E-04	8.70E-02	3.47E-02	5.16E-02	1.67E-04	8.64E-02
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	Fish Tissue	0.00E+00	0.00E+00	8.50E-02	0.00E+00	9.45E-05	8.51E-02	8.50E-02	0.00E+00	6.86E-05	8.50E-02
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	Fish Tissue	2.43E+01	2.41E+01	3.86E-01	4.37E+00	4.05E-04	4.76E+00	3.38E-01	4.34E+00	2.99E-04	4.68E+00
PAHS																
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	Fish Tissue	--	--	2.97E-04	0.00E+00	3.02E-06	3.00E-04	2.97E-04	0.00E+00	3.02E-06	3.00E-04
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	Fish Tissue	4.40E-03	4.40E-03	5.67E-04	7.92E-04	6.75E-06	1.37E-03	5.17E-04	7.92E-04	5.54E-06	1.31E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	Fish Tissue	5.10E-03	5.10E-03	3.96E-04	9.18E-04	4.77E-03	6.08E-03	3.96E-04	9.18E-04	3.87E-03	5.18E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	Fish Tissue	--	--	5.85E-04	0.00E+00	1.08E-06	5.86E-04	5.33E-04	0.00E+00	1.08E-06	5.34E-04
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	Fish Tissue	--	--	1.08E-03	0.00E+00	6.30E-06	1.09E-03	1.08E-03	0.00E+00	6.30E-06	1.09E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	Fish Tissue	--	--	9.90E-04	0.00E+00	2.30E-06	9.92E-04	9.90E-04	0.00E+00	2.30E-06	9.92E-04
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	Fish Tissue	--	--	1.71E-03	0.00E+00	2.21E-06	1.71E-03	1.71E-03	0.00E+00	2.21E-06	1.71E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	Fish Tissue	--	--	7.47E-04	0.00E+00	3.33E-06	7.50E-04	7.47E-04	0.00E+00	3.33E-06	7.50E-04
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	Fish Tissue	--	--	2.43E-05	0.00E+00	3.11E-06	2.74E-05	2.43E-05	0.00E+00	3.11E-06	2.74E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	Fish Tissue	--	--	9.00E-04	0.00E+00	4.95E-06	9.05E-04	9.00E-04	0.00E+00	4.95E-06	9.05E-04
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	2.34E-04	0.00E+00	3.29E-06	2.37E-04	1.34E-04	0.00E+00	3.29E-06	1.37E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	Fish Tissue	--	--	1.98E-03	0.00E+00	2.52E-05	2.01E-03	1.98E-03	0.00E+00	2.20E-05	2.00E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	7.83E-04	0.00E+00	3.29E-06	7.86E-04	7.83E-04	0.00E+00	3.29E-06	7.86E-04
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	Fish Tissue	--	--	7.47E-03	0.00E+00	1.62E-05	7.49E-03	7.47E-03	0.00E+00	7.79E-06	7.48E-03
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	Fish Tissue	1.00E-02	9.68E-03	1.80E-03	1.80E-03	5.85E-06	3.61E-03	1.80E-03	1.74E-03	5.13E-06	3.55E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	Fish Tissue	--	--	1.26E-03	0.00E+00	1.40E-05	1.27E-03	1.26E-03	0.00E+00	1.40E-05	1.27E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	Fish Tissue	NA[B]	NA[B]	7.73E-03	0.00E+00	4.27E-05	7.77E-03	7.63E-03	0.00E+00	4.27E-05	7.67E-03
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	Fish Tissue	NA[B]	NA[B]	7.73E-03	0.00E+00	4.27E-05	7.77E-03	7.63E-03	0.00E+00	4.27E-05	7.67E-03
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	Fish Tissue	NA[B]	NA[B]	1.31E-02	3.51E-03	4.83E-03	2.14E-02	1.30E-02	3.45E-03	3.91E-03	2.04E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	Fish Tissue	NA[B]	NA[B]	1.31E-02	3.51E-03	4.83E-03	2.14E-02	1.30E-02	3.45E-03	3.91E-03	2.04E-02
PCBS																
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	Fish Tissue	4.54E-01	4.54E-01	3.91E-05	8.17E-02	0.00E+00	8.18E-02	3.55E-05	8.17E-02	0.00E+00	8.18E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	Fish Tissue	4.74E-01	4.74E-01	5.25E-05	8.53E-02	0.00E+00	8.54E-02	4.79E-05	8.53E-02	0.00E+00	8.54E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.7
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	2.42E-06	4.06E-07	0.00E+00	2.82E-06	4.49E-07	7.56E-08	0.00E+00	5.25E-07
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	2.21E-07	1.19E-07	0.00E+00	3.39E-07	6.74E-08	3.63E-08	0.00E+00	1.04E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	2.10E-08	1.48E-08	0.00E+00	3.58E-08	1.03E-08	7.29E-09	0.00E+00	1.76E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	8.40E-09	1.92E-08	0.00E+00	2.76E-08	3.26E-09	7.47E-09	0.00E+00	1.07E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	3.78E-08	3.15E-07	0.00E+00	3.53E-07	1.58E-08	1.32E-07	0.00E+00	1.48E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	7.25E-08	7.59E-07	0.00E+00	8.31E-07	2.26E-08	2.37E-07	0.00E+00	2.60E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	1.37E-08	1.14E-07	0.00E+00	1.28E-07	8.16E-09	6.81E-08	0.00E+00	7.62E-08
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	3.78E-08	3.69E-08	0.00E+00	7.47E-08	1.27E-08	1.24E-08	0.00E+00	2.52E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	1.47E-09	2.82E-08	0.00E+00	2.97E-08	1.08E-09	2.06E-08	0.00E+00	2.17E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	1.16E-08	4.30E-07	0.00E+00	4.41E-07	4.07E-09	1.51E-07	0.00E+00	1.56E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	1.37E-08	7.35E-09	0.00E+00	2.10E-08	7.53E-09	4.05E-09	0.00E+00	1.16E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	1.26E-08	1.05E-07	0.00E+00	1.18E-07	6.11E-09	5.10E-08	0.00E+00	5.71E-08
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	1.47E-08	5.40E-07	0.00E+00	5.54E-07	8.15E-09	2.99E-07	0.00E+00	3.08E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	4.52E-09	2.12E-07	0.00E+00	2.17E-07	1.81E-09	8.50E-08	0.00E+00	8.68E-08
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	3.05E-08	1.11E-06	0.00E+00	1.14E-06	1.22E-08	4.46E-07	0.00E+00	4.58E-07
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	3.47E-05	2.92E-06	0.00E+00	3.76E-05	6.97E-06	5.87E-07	0.00E+00	7.56E-06
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	9.24E-07	2.05E-06	0.00E+00	2.98E-06	2.80E-07	6.22E-07	0.00E+00	9.02E-07
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	8.24E-08	2.37E-06	0.00E+00	2.45E-06	3.37E-08	1.01E-06	0.00E+00	1.05E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	8.82E-02	1.76E+01	0.00E+00	1.77E+01	3.53E-02	7.07E+00	0.00E+00	7.10E+00
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	4.00E-03	Benthic Tissue	1.00E+02	8.87E+01	2.64E+01	2.11E+01	4.70E-03	4.74E+01	2.33E+01	1.86E+01	2.20E-03	4.19E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	3.15E-02	Benthic Tissue	1.04E-01	4.47E-02	3.47E-03	2.18E-02	1.66E-05	2.53E-02	1.49E-03	9.38E-03	1.09E-05	1.09E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	5.41E-02	Benthic Tissue	3.89E+00	1.49E+00	7.56E-02	8.18E-01	3.95E-04	8.94E-01	2.90E-02	3.14E-01	2.28E-04	3.43E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	2.31E-03	0.00E+00	2.44E-06	2.31E-03	1.74E-03	0.00E+00	2.44E-06	1.75E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	7.76E-03	Benthic Tissue	5.97E-02	2.30E-02	8.09E-03	1.25E-02	0.00E+00	2.06E-02	3.12E-03	4.83E-03	0.00E+00	7.95E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	4.68E-03	Benthic Tissue	2.36E+00	1.11E+00	5.29E-01	4.95E-01	2.55E-04	1.02E+00	2.48E-01	2.32E-01	1.92E-04	4.80E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	9.67E-03	Benthic Tissue	5.12E-01	2.84E-01	5.57E-02	1.08E-01	2.70E-05	1.63E-01	3.08E-02	5.96E-02	2.05E-05	9.04E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	7.75E-03	Benthic Tissue	4.61E+00	1.33E+00	6.25E-01	9.68E-01	1.51E-04	1.59E+00	1.81E-01	2.80E-01	1.22E-04	4.61E-01
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	4.63E-03	Benthic Tissue	5.56E+02	3.54E+02	1.26E+02	1.17E+02	1.10E-02	2.43E+02	8.02E+01	7.43E+01	5.39E-03	1.54E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	3.62E-03	Benthic Tissue	4.64E+00	1.27E+00	1.34E+00	9.74E-01	2.91E-05	2.32E+00	3.68E-01	2.67E-01	1.00E-05	6.35E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	5.47E-03	Benthic Tissue	8.69E+00	6.94E+00	1.67E+00	1.82E+00	1.03E-02	3.50E+00	1.33E+00	1.46E+00	3.64E-03	2.79E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	1.43E-02	Benthic Tissue	2.44E-02	9.83E-03	1.79E-03	5.11E-03	3.28E-06	6.90E-03	7.20E-04	2.06E-03	2.98E-06	2.79E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	1.14E-02	Benthic Tissue	6.42E-01	4.86E-01	5.92E-02	1.35E-01	4.11E-04	1.94E-01	4.48E-02	1.02E-01	3.31E-04	1.47E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	5.24E-02	Benthic Tissue	6.45E-01	2.42E-01	1.29E-02	1.35E-01	1.27E-03	1.50E-01	4.84E-03	5.08E-02	7.00E-04	5.64E-02
SILVER	--	2.80E+00	1.39E+00	--	--	2.02E-02	Benthic Tissue	5.66E-02	2.80E-02	2.94E-03	1.19E-02	0.00E+00	1.48E-02	1.45E-03	5.88E-03	0.00E+00	7.34E-03
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	1.39E-02	Benthic Tissue	1.36E-02	7.64E-03	1.03E-03	2.86E-03	6.76E-06	3.90E-03	5.78E-04	1.61E-03	2.92E-06	2.19E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	8.48E-03	Benthic Tissue	1.70E+00	7.23E-01	2.10E-01	3.56E-01	1.66E-04	5.66E-01	8.95E-02	1.52E-01	1.28E-04	2.41E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	5.41E-02	Benthic Tissue	9.19E+00	6.28E+00	1.79E-01	1.93E+00	1.46E-04	2.11E+00	1.22E-01	1.32E+00	5.59E-05	1.44E+00
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	2.45E-02	Benthic Tissue	6.68E+01	2.44E+01	2.87E+00	1.40E+01	4.40E-03	1.69E+01	1.05E+00	5.13E+00	8.54E-04	6.18E+00

TABLE C.7
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	1.69E-01	Benthic Tissue	5.58E-01	2.24E-01	3.47E-03	1.17E-01	1.04E-05	1.21E-01	1.39E-03	4.71E-02	3.52E-06	4.85E-02
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	3.50E-02	Benthic Tissue	2.28E-01	7.91E-02	6.83E-03	4.78E-02	1.82E-05	5.46E-02	2.37E-03	1.66E-02	4.56E-06	1.90E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	8.48E-02	Benthic Tissue	5.00E-01	2.85E-01	6.20E-03	1.05E-01	4.70E-03	1.16E-01	3.54E-03	5.99E-02	2.20E-03	6.57E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	5.02E-02	Benthic Tissue	2.06E+00	3.00E-01	4.31E-02	4.32E-01	1.25E-05	4.75E-01	6.26E-03	6.29E-02	3.62E-06	6.92E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	8.24E-02	Benthic Tissue	1.73E+00	7.35E-01	2.21E-02	3.63E-01	9.36E-05	3.85E-01	9.37E-03	1.54E-01	7.12E-06	1.64E-01
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	1.49E-01	Benthic Tissue	9.12E+00	2.04E+00	6.41E-02	1.91E+00	4.52E-04	1.98E+00	1.43E-02	4.29E-01	5.10E-05	4.43E-01
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	7.31E-02	Benthic Tissue	4.09E+00	9.17E-01	5.88E-02	8.60E-01	3.54E-04	9.19E-01	1.32E-02	1.92E-01	3.95E-05	2.06E-01
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	4.74E-02	Benthic Tissue	2.51E+00	6.00E-01	5.57E-02	5.27E-01	4.16E-04	5.83E-01	1.33E-02	1.26E-01	5.12E-05	1.39E-01
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	2.33E-02	Benthic Tissue	4.65E-01	1.65E-01	2.10E-02	9.77E-02	4.99E-04	1.19E-01	7.46E-03	3.47E-02	5.89E-05	4.22E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	1.89E-02	0.00E+00	4.78E-04	1.94E-02	4.77E-03	0.00E+00	5.31E-05	4.83E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	1.45E-01	Benthic Tissue	9.16E+00	1.84E+00	6.62E-02	1.92E+00	4.99E-04	1.99E+00	1.33E-02	3.87E-01	5.64E-05	4.00E-01
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	1.78E-01	Benthic Tissue	1.12E+00	4.37E-01	6.62E-03	2.35E-01	5.72E-04	2.42E-01	2.58E-03	9.17E-02	6.34E-05	9.44E-02
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	3.10E-01	Benthic Tissue	4.34E+01	9.37E+00	1.47E-01	9.11E+00	2.44E-04	9.26E+00	3.17E-02	1.97E+00	2.25E-05	2.00E+00
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	2.79E-02	Benthic Tissue	1.26E-01	8.12E-02	4.73E-03	2.64E-02	7.80E-06	3.11E-02	3.05E-03	1.70E-02	3.16E-06	2.01E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	5.66E-02	Benthic Tissue	1.41E+00	3.94E-01	2.63E-02	2.97E-01	5.15E-04	3.24E-01	7.32E-03	8.28E-02	6.01E-05	9.02E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	1.75E-02	Benthic Tissue	1.26E+02	3.76E+01	7.56E+00	2.64E+01	3.48E-04	3.40E+01	2.26E+00	7.89E+00	6.61E-05	1.01E+01
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	7.59E-02	Benthic Tissue	1.52E+00	1.11E+00	2.10E-02	3.19E-01	6.24E-05	3.40E-01	1.54E-02	2.34E-01	7.44E-06	2.49E-01
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	3.45E-01	Benthic Tissue	2.04E+01	5.41E+00	6.20E-02	4.28E+00	2.44E-04	4.34E+00	1.65E-02	1.14E+00	2.37E-05	1.15E+00
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	4.83E+01	1.18E+01	3.79E-01	1.01E+01	4.03E-03	1.05E+01	9.27E-02	2.48E+00	4.57E-04	2.57E+00
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	1.76E+02	4.98E+01	7.81E+00	3.70E+01	5.50E-03	4.48E+01	2.33E+00	1.04E+01	2.32E-03	1.28E+01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	6.35E+00	Benthic Tissue	2.92E+00	1.14E+00	4.83E-04	6.14E-01	0.00E+00	6.14E-01	1.89E-04	2.40E-01	0.00E+00	2.40E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	6.90E+00	Benthic Tissue	3.37E+00	1.83E+00	5.13E-04	7.08E-01	0.00E+00	7.09E-01	2.78E-04	3.84E-01	0.00E+00	3.84E-01
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	2.00E-05	4.83E-03	0.00E+00	4.85E-03	2.00E-05	4.83E-03	0.00E+00	4.85E-03
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	8.30E-05	1.66E-02	3.74E-03	2.04E-02	8.30E-05	1.66E-02	6.49E-04	1.73E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	5.15E-06	1.03E-03	2.08E-03	3.11E-03	5.15E-06	1.03E-03	1.35E-04	1.17E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	5.99E-05	1.20E-02	7.80E-04	1.28E-02	5.99E-05	1.20E-02	1.45E-04	1.22E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.8
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	4.52E-07	7.60E-08	0.00E+00	5.27E-07	2.78E-07	4.68E-08	0.00E+00	3.25E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	9.98E-08	5.37E-08	0.00E+00	1.53E-07	5.34E-08	2.88E-08	0.00E+00	8.22E-08
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	2.21E-08	1.56E-08	0.00E+00	3.76E-08	2.21E-08	1.56E-08	0.00E+00	3.76E-08
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	4.94E-09	1.13E-08	0.00E+00	1.62E-08	4.94E-09	1.13E-08	0.00E+00	1.62E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	4.20E-08	3.51E-07	0.00E+00	3.93E-07	4.20E-08	3.51E-07	0.00E+00	3.93E-07
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	3.15E-08	3.30E-07	0.00E+00	3.61E-07	3.15E-08	3.30E-07	0.00E+00	3.61E-07
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	1.16E-08	9.64E-08	0.00E+00	1.08E-07	1.16E-08	9.64E-08	0.00E+00	1.08E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	2.10E-08	2.05E-08	0.00E+00	4.15E-08	2.10E-08	2.05E-08	0.00E+00	4.15E-08
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	3.68E-09	7.05E-08	0.00E+00	7.42E-08	3.68E-09	7.05E-08	0.00E+00	7.42E-08
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	4.10E-09	1.52E-07	0.00E+00	1.57E-07	4.10E-09	1.52E-07	0.00E+00	1.57E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	2.00E-08	1.07E-08	0.00E+00	3.07E-08	2.00E-08	1.07E-08	0.00E+00	3.07E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	5.67E-09	4.73E-08	0.00E+00	5.30E-08	5.67E-09	4.73E-08	0.00E+00	5.30E-08
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	1.16E-08	4.24E-07	0.00E+00	4.36E-07	1.16E-08	4.24E-07	0.00E+00	4.36E-07
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	1.47E-08	5.37E-07	0.00E+00	5.52E-07	8.00E-09	2.92E-07	0.00E+00	3.00E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	1.16E-05	9.72E-07	0.00E+00	1.25E-05	1.11E-05	9.36E-07	0.00E+00	1.21E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	9.03E-08	2.01E-07	0.00E+00	2.91E-07	7.58E-08	1.68E-07	0.00E+00	2.44E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	4.41E-08	1.18E-06	0.00E+00	1.22E-06	3.67E-08	9.33E-07	0.00E+00	9.70E-07
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	4.41E-08	1.18E-06	0.00E+00	1.22E-06	3.67E-08	9.33E-07	0.00E+00	9.70E-07
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	4.00E-03	Benthic Tissue	8.16E+01	8.16E+01	2.14E+01	1.71E+01	5.51E-03	3.86E+01	2.14E+01	1.71E+01	4.47E-03	3.86E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	3.15E-02	Benthic Tissue	5.35E-02	5.35E-02	1.79E-03	1.12E-02	1.56E-05	1.30E-02	1.79E-03	1.12E-02	1.32E-05	1.30E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	5.41E-02	Benthic Tissue	8.76E-01	5.79E-01	1.70E-02	1.84E-01	3.33E-04	2.01E-01	1.12E-02	1.22E-01	2.44E-04	1.33E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	1.79E-03	0.00E+00	1.98E-06	1.79E-03	1.79E-03	0.00E+00	1.98E-06	1.79E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	7.76E-03	Benthic Tissue	1.24E-02	1.05E-02	1.68E-03	2.61E-03	0.00E+00	4.29E-03	1.42E-03	2.20E-03	0.00E+00	3.61E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	4.68E-03	Benthic Tissue	1.05E+00	9.56E-01	2.36E-01	2.21E-01	7.38E-04	4.58E-01	2.15E-01	2.01E-01	6.53E-04	4.16E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	9.67E-03	Benthic Tissue	1.91E-01	1.91E-01	2.08E-02	4.02E-02	3.54E-05	6.10E-02	2.08E-02	4.02E-02	2.51E-05	6.10E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	7.75E-03	Benthic Tissue	8.14E-01	7.10E-01	1.10E-01	1.71E-01	1.35E-04	2.81E-01	9.62E-02	1.49E-01	1.22E-04	2.45E-01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	4.63E-03	Benthic Tissue	2.03E+02	1.27E+02	4.60E+01	4.26E+01	1.28E-02	8.86E+01	2.88E+01	2.67E+01	8.02E-03	5.55E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	3.62E-03	Benthic Tissue	4.39E-01	3.83E-01	1.27E-01	9.21E-02	2.39E-05	2.19E-01	1.11E-01	8.04E-02	1.83E-05	1.91E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	5.47E-03	Benthic Tissue	6.89E+00	6.89E+00	1.32E+00	1.45E+00	4.44E-03	2.77E+00	1.32E+00	1.45E+00	4.23E-03	2.77E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	1.43E-02	Benthic Tissue	5.59E-03	3.25E-03	4.10E-04	1.17E-03	2.03E-06	1.58E-03	2.38E-04	6.83E-04	2.03E-06	9.23E-04
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	1.14E-02	Benthic Tissue	4.26E-01	2.79E-01	3.93E-02	8.94E-02	3.43E-04	1.29E-01	2.57E-02	5.86E-02	2.94E-04	8.46E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	5.24E-02	Benthic Tissue	1.26E-01	1.26E-01	2.52E-03	2.64E-02	8.89E-04	2.98E-02	2.52E-03	2.64E-02	6.54E-04	2.96E-02
SILVER	--	9.40E-01	8.58E-01	--	--	2.02E-02	Benthic Tissue	1.90E-02	1.74E-02	9.87E-04	3.99E-03	0.00E+00	4.98E-03	9.01E-04	3.65E-03	0.00E+00	4.55E-03
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	1.39E-02	Benthic Tissue	3.89E-03	3.89E-03	2.94E-04	8.17E-04	5.20E-06	1.12E-03	2.94E-04	8.17E-04	4.74E-06	1.12E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	8.48E-03	Benthic Tissue	3.26E-01	3.26E-01	4.04E-02	6.85E-02	1.92E-04	1.09E-01	4.04E-02	6.85E-02	1.92E-04	1.09E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	5.41E-02	Benthic Tissue	5.11E+00	5.11E+00	9.91E-02	1.07E+00	1.09E-04	1.17E+00	9.91E-02	1.07E+00	7.92E-05	1.17E+00
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	2.45E-02	Benthic Tissue	1.05E+01	9.20E+00	4.50E-01	2.20E+00	4.68E-04	2.65E+00	3.95E-01	1.93E+00	3.45E-04	2.33E+00

TABLE C.8
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	1.69E-01	Benthic Tissue	5.58E-02	5.58E-02	3.47E-04	1.17E-02	3.48E-06	1.21E-02	3.47E-04	1.17E-02	3.48E-06	1.21E-02
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	3.50E-02	Benthic Tissue	2.21E-02	2.01E-02	6.62E-04	4.63E-03	7.80E-06	5.30E-03	6.03E-04	4.22E-03	6.40E-06	4.83E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	8.48E-02	Benthic Tissue	3.73E-02	3.73E-02	4.62E-04	7.83E-03	5.51E-03	1.38E-02	4.62E-04	7.83E-03	4.47E-03	1.28E-02
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	5.02E-02	Benthic Tissue	1.91E-02	1.91E-02	3.99E-04	4.01E-03	0.00E+00	4.41E-03	3.99E-04	4.01E-03	0.00E+00	4.41E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	8.24E-02	Benthic Tissue	5.35E-02	4.88E-02	6.83E-04	1.12E-02	1.25E-06	1.19E-02	6.22E-04	1.02E-02	1.25E-06	1.09E-02
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	1.49E-01	Benthic Tissue	1.79E-01	1.79E-01	1.26E-03	3.77E-02	7.28E-06	3.89E-02	1.26E-03	3.77E-02	7.28E-06	3.89E-02
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	7.31E-02	Benthic Tissue	8.04E-02	8.04E-02	1.16E-03	1.69E-02	2.65E-06	1.80E-02	1.16E-03	1.69E-02	2.65E-06	1.80E-02
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	4.74E-02	Benthic Tissue	9.00E-02	9.00E-02	2.00E-03	1.89E-02	2.55E-06	2.09E-02	2.00E-03	1.89E-02	2.55E-06	2.09E-02
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	2.33E-02	Benthic Tissue	1.93E-02	1.93E-02	8.72E-04	4.06E-03	3.85E-06	4.93E-03	8.72E-04	4.06E-03	3.85E-06	4.93E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	2.84E-05	0.00E+00	3.59E-06	3.19E-05	2.84E-05	0.00E+00	3.59E-06	3.19E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	1.45E-01	Benthic Tissue	1.45E-01	1.45E-01	1.05E-03	3.05E-02	5.72E-06	3.16E-02	1.05E-03	3.05E-02	5.72E-06	3.16E-02
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	1.78E-01	Benthic Tissue	4.62E-02	2.65E-02	2.73E-04	9.71E-03	3.80E-06	9.98E-03	1.56E-04	5.56E-03	3.80E-06	5.72E-03
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	3.10E-01	Benthic Tissue	6.82E-01	6.82E-01	2.31E-03	1.43E-01	2.91E-05	1.46E-01	2.31E-03	1.43E-01	2.54E-05	1.46E-01
FLUORENE	Low	6.30E-01	3.22E-01	--	--	2.79E-02	Benthic Tissue	1.76E-02	8.99E-03	6.62E-04	3.70E-03	0.00E+00	4.36E-03	3.38E-04	1.89E-03	0.00E+00	2.23E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	5.66E-02	Benthic Tissue	4.92E-02	4.92E-02	9.14E-04	1.03E-02	3.80E-06	1.13E-02	9.14E-04	1.03E-02	3.80E-06	1.13E-02
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	1.75E-02	Benthic Tissue	1.45E-01	1.45E-01	8.72E-03	3.05E-02	1.87E-05	3.92E-02	8.72E-03	3.05E-02	9.00E-06	3.92E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	7.59E-02	Benthic Tissue	1.52E-01	1.52E-01	2.10E-03	3.19E-02	6.76E-06	3.40E-02	2.10E-03	3.19E-02	5.93E-06	3.40E-02
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	3.45E-01	Benthic Tissue	4.84E-01	4.84E-01	1.47E-03	1.02E-01	1.61E-05	1.03E-01	1.47E-03	1.02E-01	1.61E-05	1.03E-01
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	--	Benthic Tissue	NA	NA	9.02E-03	2.30E-01	4.93E-05	2.39E-01	8.90E-03	2.26E-01	4.93E-05	2.34E-01
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	--	Benthic Tissue	NA	NA	9.02E-03	2.30E-01	4.93E-05	2.39E-01	8.90E-03	2.26E-01	4.93E-05	2.34E-01
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	--	Benthic Tissue	NA	NA	1.63E-02	2.49E-01	5.58E-03	2.71E-01	1.59E-02	2.45E-01	4.52E-03	2.66E-01
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	--	Benthic Tissue	NA	NA	1.63E-02	2.49E-01	5.58E-03	2.71E-01	1.59E-02	2.45E-01	4.52E-03	2.66E-01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	6.35E+00	Benthic Tissue	2.75E-01	2.50E-01	4.56E-05	5.78E-02	0.00E+00	5.79E-02	4.14E-05	5.25E-02	0.00E+00	5.26E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	6.90E+00	Benthic Tissue	4.02E-01	3.67E-01	6.12E-05	8.45E-02	0.00E+00	8.46E-02	5.59E-05	7.71E-02	0.00E+00	7.72E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.9
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	2.42E-06	4.06E-07	0.00E+00	2.82E-06	4.49E-07	7.56E-08	0.00E+00	5.25E-07
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	2.21E-07	1.19E-07	0.00E+00	3.39E-07	6.74E-08	3.63E-08	0.00E+00	1.04E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	2.10E-08	1.48E-08	0.00E+00	3.58E-08	1.03E-08	7.29E-09	0.00E+00	1.76E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	8.40E-09	1.92E-08	0.00E+00	2.76E-08	3.26E-09	7.47E-09	0.00E+00	1.07E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	3.78E-08	3.15E-07	0.00E+00	3.53E-07	1.58E-08	1.32E-07	0.00E+00	1.48E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	7.25E-08	7.59E-07	0.00E+00	8.31E-07	2.26E-08	2.37E-07	0.00E+00	2.60E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	1.37E-08	1.14E-07	0.00E+00	1.28E-07	8.16E-09	6.81E-08	0.00E+00	7.62E-08
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	3.78E-08	3.69E-08	0.00E+00	7.47E-08	1.27E-08	1.24E-08	0.00E+00	2.52E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	1.47E-09	2.82E-08	0.00E+00	2.97E-08	1.08E-09	2.06E-08	0.00E+00	2.17E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	1.16E-08	4.30E-07	0.00E+00	4.41E-07	4.07E-09	1.51E-07	0.00E+00	1.56E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	1.37E-08	7.35E-09	0.00E+00	2.10E-08	7.53E-09	4.05E-09	0.00E+00	1.16E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	1.26E-08	1.05E-07	0.00E+00	1.18E-07	6.11E-09	5.10E-08	0.00E+00	5.71E-08
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	1.47E-08	5.40E-07	0.00E+00	5.54E-07	8.15E-09	2.99E-07	0.00E+00	3.08E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	4.52E-09	2.12E-07	0.00E+00	2.17E-07	1.81E-09	8.50E-08	0.00E+00	8.68E-08
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	3.05E-08	1.11E-06	0.00E+00	1.14E-06	1.22E-08	4.46E-07	0.00E+00	4.58E-07
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	3.47E-05	2.92E-06	0.00E+00	3.76E-05	6.97E-06	5.87E-07	0.00E+00	7.56E-06
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	9.24E-07	2.05E-06	0.00E+00	2.98E-06	2.80E-07	6.22E-07	0.00E+00	9.02E-07
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	8.24E-08	2.37E-06	0.00E+00	2.45E-06	3.37E-08	1.01E-06	0.00E+00	1.05E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	8.82E-02	1.76E+01	0.00E+00	1.77E+01	3.53E-02	7.07E+00	0.00E+00	7.10E+00
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Crab Tissue	7.20E+00	6.46E+00	2.64E+01	1.51E+00	4.70E-03	2.79E+01	2.33E+01	1.36E+00	2.20E-03	2.46E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Crab Tissue	3.91E-02	3.39E-02	3.47E-03	8.22E-03	1.66E-05	1.17E-02	1.49E-03	7.12E-03	1.09E-05	8.62E-03
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Crab Tissue	1.24E+00	1.22E+00	7.56E-02	2.61E-01	3.95E-04	3.37E-01	2.90E-02	2.55E-01	2.28E-04	2.85E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Crab Tissue	--	--	2.31E-03	0.00E+00	2.44E-06	2.31E-03	1.74E-03	0.00E+00	2.44E-06	1.75E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	--	Crab Tissue	1.58E-01	1.51E-01	8.09E-03	3.32E-02	0.00E+00	4.13E-02	3.12E-03	3.17E-02	0.00E+00	3.48E-02
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Crab Tissue	2.12E-01	1.96E-01	5.29E-01	4.45E-02	2.55E-04	5.74E-01	2.48E-01	4.11E-02	1.92E-04	2.89E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Crab Tissue	1.38E-01	1.26E-01	5.57E-02	2.91E-02	2.70E-05	8.47E-02	3.08E-02	2.64E-02	2.05E-05	5.72E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Crab Tissue	1.25E+01	1.07E+01	6.25E-01	2.62E+00	1.51E-04	3.25E+00	1.81E-01	2.25E+00	1.22E-04	2.43E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Crab Tissue	5.01E+01	4.47E+01	1.26E+02	1.05E+01	1.10E-02	1.37E+02	8.02E+01	9.40E+00	5.39E-03	8.96E+01
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Crab Tissue	1.71E-01	1.51E-01	1.34E+00	3.59E-02	2.91E-05	1.38E+00	3.68E-01	3.16E-02	1.00E-05	4.00E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Crab Tissue	1.10E+01	8.76E+00	1.67E+00	2.32E+00	1.03E-02	4.00E+00	1.33E+00	1.84E+00	3.64E-03	3.18E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Crab Tissue	2.10E-02	1.91E-02	1.79E-03	4.40E-03	3.28E-06	6.19E-03	7.20E-04	4.02E-03	2.98E-06	4.74E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Crab Tissue	1.95E-01	1.88E-01	5.92E-02	4.09E-02	4.11E-04	1.01E-01	4.48E-02	3.95E-02	3.31E-04	8.47E-02
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Crab Tissue	1.07E+00	1.00E+00	1.29E-02	2.26E-01	1.27E-03	2.40E-01	4.84E-03	2.10E-01	7.00E-04	2.16E-01
SILVER	--	2.80E+00	1.39E+00	--	--	--	Crab Tissue	3.61E-01	3.27E-01	2.94E-03	7.59E-02	0.00E+00	7.88E-02	1.45E-03	6.87E-02	0.00E+00	7.01E-02
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Crab Tissue	1.29E-03	1.29E-03	1.03E-03	2.70E-04	6.76E-06	1.31E-03	5.78E-04	2.70E-04	2.92E-06	8.51E-04
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Crab Tissue	4.67E-02	4.67E-02	2.10E-01	9.80E-03	1.66E-04	2.20E-01	8.95E-02	9.80E-03	1.28E-04	9.94E-02
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Crab Tissue	0.00E+00	0.00E+00	1.79E-01	0.00E+00	1.46E-04	1.79E-01	1.22E-01	0.00E+00	5.59E-05	1.22E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Crab Tissue	4.59E+01	4.59E+01	2.87E+00	9.64E+00	4.40E-03	1.25E+01	1.05E+00	9.64E+00	8.54E-04	1.07E+01

TABLE C.9
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Crab Tissue	--	--	3.47E-03	0.00E+00	1.04E-05	3.48E-03	1.39E-03	0.00E+00	3.52E-06	1.40E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Crab Tissue	2.80E-03	2.80E-03	6.83E-03	5.88E-04	1.82E-05	7.43E-03	2.37E-03	5.88E-04	4.56E-06	2.96E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Crab Tissue	1.19E-02	1.19E-02	6.20E-03	2.49E-03	4.70E-03	1.34E-02	3.54E-03	2.49E-03	2.20E-03	8.23E-03
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Crab Tissue	6.69E-03	6.69E-03	4.31E-02	1.40E-03	1.25E-05	4.45E-02	6.26E-03	1.40E-03	3.62E-06	7.67E-03
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Crab Tissue	1.01E-02	1.01E-02	2.21E-02	2.13E-03	9.36E-05	2.43E-02	9.37E-03	2.13E-03	7.12E-06	1.15E-02
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Crab Tissue	--	--	6.41E-02	0.00E+00	4.52E-04	6.45E-02	1.43E-02	0.00E+00	5.10E-05	1.44E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Crab Tissue	4.85E-03	4.85E-03	5.88E-02	1.02E-03	3.54E-04	6.02E-02	1.32E-02	1.02E-03	3.95E-05	1.42E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Crab Tissue	3.15E-02	2.77E-02	5.57E-02	6.61E-03	4.16E-04	6.27E-02	1.33E-02	5.82E-03	5.12E-05	1.92E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Crab Tissue	--	--	2.10E-02	0.00E+00	4.99E-04	2.15E-02	7.46E-03	0.00E+00	5.89E-05	7.52E-03
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Crab Tissue	3.92E-03	3.92E-03	1.89E-02	8.23E-04	4.78E-04	2.02E-02	4.77E-03	8.23E-04	5.31E-05	5.65E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Crab Tissue	8.95E-03	8.95E-03	6.62E-02	1.88E-03	4.99E-04	6.85E-02	1.33E-02	1.88E-03	5.64E-05	1.52E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Crab Tissue	--	--	6.62E-03	0.00E+00	5.72E-04	7.19E-03	2.58E-03	0.00E+00	6.34E-05	2.64E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Crab Tissue	8.69E-02	7.79E-02	1.47E-01	1.83E-02	2.44E-04	1.66E-01	3.17E-02	1.64E-02	2.25E-05	4.81E-02
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	--	Crab Tissue	1.75E-03	1.75E-03	4.73E-03	3.68E-04	7.80E-06	5.10E-03	3.05E-03	3.68E-04	3.16E-06	3.42E-03
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Crab Tissue	--	--	2.63E-02	0.00E+00	5.15E-04	2.68E-02	7.32E-03	0.00E+00	6.01E-05	7.38E-03
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Crab Tissue	1.60E-02	1.60E-02	7.56E+00	3.35E-03	3.48E-04	7.56E+00	2.26E+00	3.35E-03	6.61E-05	2.26E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Crab Tissue	1.60E-02	1.60E-02	2.10E-02	3.36E-03	6.24E-05	2.44E-02	1.54E-02	3.35E-03	7.44E-06	1.87E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Crab Tissue	4.74E-02	4.13E-02	6.20E-02	9.95E-03	2.44E-04	7.21E-02	1.65E-02	8.67E-03	2.37E-05	2.51E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	9.65E-02	8.67E-02	3.79E-01	2.03E-02	4.03E-03	4.04E-01	9.27E-02	1.82E-02	4.57E-04	1.11E-01
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	1.52E-01	1.43E-01	7.81E+00	3.19E-02	5.50E-03	7.85E+00	2.33E+00	3.00E-02	2.32E-03	2.36E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Crab Tissue	1.44E-01	1.37E-01	4.83E-04	3.03E-02	0.00E+00	3.08E-02	1.89E-04	2.88E-02	0.00E+00	2.89E-02
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Crab Tissue	2.10E-01	1.99E-01	5.13E-04	4.40E-02	0.00E+00	4.45E-02	2.78E-04	4.18E-02	0.00E+00	4.21E-02
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	2.00E-05	4.83E-03	0.00E+00	4.85E-03	2.00E-05	4.83E-03	0.00E+00	4.85E-03
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	8.30E-05	1.66E-02	3.74E-03	2.04E-02	8.30E-05	1.66E-02	6.49E-04	1.73E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	5.15E-06	1.03E-03	2.08E-03	3.11E-03	5.15E-06	1.03E-03	1.35E-04	1.17E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	5.99E-05	1.20E-02	7.80E-04	1.28E-02	5.99E-05	1.20E-02	1.45E-04	1.22E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.10
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	4.52E-07	7.60E-08	0.00E+00	5.27E-07	2.78E-07	4.68E-08	0.00E+00	3.25E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	9.98E-08	5.37E-08	0.00E+00	1.53E-07	5.34E-08	2.88E-08	0.00E+00	8.22E-08
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	2.21E-08	1.56E-08	0.00E+00	3.76E-08	2.21E-08	1.56E-08	0.00E+00	3.76E-08
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	4.94E-09	1.13E-08	0.00E+00	1.62E-08	4.94E-09	1.13E-08	0.00E+00	1.62E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	4.20E-08	3.51E-07	0.00E+00	3.93E-07	4.20E-08	3.51E-07	0.00E+00	3.93E-07
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	3.15E-08	3.30E-07	0.00E+00	3.61E-07	3.15E-08	3.30E-07	0.00E+00	3.61E-07
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	1.16E-08	9.64E-08	0.00E+00	1.08E-07	1.16E-08	9.64E-08	0.00E+00	1.08E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	2.10E-08	2.05E-08	0.00E+00	4.15E-08	2.10E-08	2.05E-08	0.00E+00	4.15E-08
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	3.68E-09	7.05E-08	0.00E+00	7.42E-08	3.68E-09	7.05E-08	0.00E+00	7.42E-08
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	4.10E-09	1.52E-07	0.00E+00	1.57E-07	4.10E-09	1.52E-07	0.00E+00	1.57E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	2.00E-08	1.07E-08	0.00E+00	3.07E-08	2.00E-08	1.07E-08	0.00E+00	3.07E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	5.67E-09	4.73E-08	0.00E+00	5.30E-08	5.67E-09	4.73E-08	0.00E+00	5.30E-08
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	1.16E-08	4.24E-07	0.00E+00	4.36E-07	1.16E-08	4.24E-07	0.00E+00	4.36E-07
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	1.47E-08	5.37E-07	0.00E+00	5.52E-07	8.00E-09	2.92E-07	0.00E+00	3.00E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	1.16E-05	9.72E-07	0.00E+00	1.25E-05	1.11E-05	9.36E-07	0.00E+00	1.21E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	9.03E-08	2.01E-07	0.00E+00	2.91E-07	7.58E-08	1.68E-07	0.00E+00	2.44E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	4.41E-08	1.18E-06	0.00E+00	1.22E-06	3.67E-08	9.33E-07	0.00E+00	9.70E-07
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	4.41E-08	1.18E-06	0.00E+00	1.22E-06	3.67E-08	9.33E-07	0.00E+00	9.70E-07
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	--	Crab Tissue	4.18E+00	3.85E+00	2.14E+01	8.78E-01	5.51E-03	2.23E+01	2.14E+01	8.08E-01	4.47E-03	2.22E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	--	Crab Tissue	4.93E-02	4.01E-02	1.79E-03	1.04E-02	1.56E-05	1.22E-02	1.79E-03	8.42E-03	1.32E-05	1.02E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	--	Crab Tissue	1.26E+00	1.26E+00	1.70E-02	2.64E-01	3.33E-04	2.82E-01	1.12E-02	2.65E-01	2.44E-04	2.77E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	--	Crab Tissue	--	--	1.79E-03	0.00E+00	1.98E-06	1.79E-03	1.79E-03	0.00E+00	1.98E-06	1.79E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	--	Crab Tissue	2.21E-01	1.85E-01	1.68E-03	4.65E-02	0.00E+00	4.81E-02	1.42E-03	3.88E-02	0.00E+00	4.02E-02
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	--	Crab Tissue	1.25E-01	1.22E-01	2.36E-01	2.63E-02	7.38E-04	2.63E-01	2.15E-01	2.56E-02	6.53E-04	2.41E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	--	Crab Tissue	1.41E-01	1.23E-01	2.08E-02	2.97E-02	3.54E-05	5.05E-02	2.08E-02	2.58E-02	2.51E-05	4.66E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	--	Crab Tissue	1.62E+01	1.44E+01	1.10E-01	3.41E+00	1.35E-04	3.52E+00	9.62E-02	3.02E+00	1.22E-04	3.12E+00
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	--	Crab Tissue	2.13E+01	2.11E+01	4.60E+01	4.48E+00	1.28E-02	5.05E+01	2.88E+01	4.43E+00	8.02E-03	3.32E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	--	Crab Tissue	4.39E-02	4.30E-02	1.27E-01	9.22E-03	2.39E-05	1.36E-01	1.11E-01	9.03E-03	1.83E-05	1.20E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	--	Crab Tissue	6.07E+00	5.38E+00	1.32E+00	1.28E+00	4.44E-03	2.60E+00	1.32E+00	1.13E+00	4.23E-03	2.46E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	--	Crab Tissue	2.66E-02	2.36E-02	4.10E-04	5.59E-03	2.03E-06	6.01E-03	2.38E-04	4.97E-03	2.03E-06	5.21E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	--	Crab Tissue	2.29E-01	2.12E-01	3.93E-02	4.82E-02	3.43E-04	8.78E-02	2.57E-02	4.46E-02	2.94E-04	7.07E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	--	Crab Tissue	1.13E+00	1.10E+00	2.52E-03	2.37E-01	8.89E-04	2.41E-01	2.52E-03	2.32E-01	6.54E-04	2.35E-01
SILVER	--	9.40E-01	8.58E-01	--	--	--	Crab Tissue	3.69E-01	3.15E-01	9.87E-04	7.75E-02	0.00E+00	7.85E-02	9.01E-04	6.61E-02	0.00E+00	6.70E-02
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	--	Crab Tissue	8.52E-03	8.52E-03	2.94E-04	1.79E-03	5.20E-06	2.09E-03	2.94E-04	1.79E-03	4.74E-06	2.09E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	--	Crab Tissue	2.72E-01	2.53E-01	4.04E-02	5.71E-02	1.92E-04	9.77E-02	4.04E-02	5.32E-02	1.92E-04	9.38E-02
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	--	Crab Tissue	0.00E+00	0.00E+00	9.91E-02	0.00E+00	1.09E-04	9.92E-02	9.91E-02	0.00E+00	7.92E-05	9.92E-02
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	--	Crab Tissue	4.76E+01	4.69E+01	4.50E-01	1.00E+01	4.68E-04	1.05E+01	3.95E-01	9.85E+00	3.45E-04	1.02E+01

TABLE C.10
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	--	Crab Tissue	5.23E-04	5.23E-04	3.47E-04	1.10E-04	3.48E-06	4.60E-04	3.47E-04	1.10E-04	3.48E-06	4.60E-04
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	--	Crab Tissue	--	--	6.62E-04	0.00E+00	7.80E-06	6.69E-04	6.03E-04	0.00E+00	6.40E-06	6.09E-04
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	--	Crab Tissue	1.46E-03	1.46E-03	4.62E-04	3.06E-04	5.51E-03	6.28E-03	4.62E-04	3.06E-04	4.47E-03	5.23E-03
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	--	Crab Tissue	--	--	3.99E-04	0.00E+00	0.00E+00	3.99E-04	3.99E-04	0.00E+00	0.00E+00	3.99E-04
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	--	Crab Tissue	--	--	6.83E-04	0.00E+00	1.25E-06	6.84E-04	6.22E-04	0.00E+00	1.25E-06	6.23E-04
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	--	Crab Tissue	--	--	1.26E-03	0.00E+00	7.28E-06	1.27E-03	1.26E-03	0.00E+00	7.28E-06	1.27E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	--	Crab Tissue	--	--	1.16E-03	0.00E+00	2.65E-06	1.16E-03	1.16E-03	0.00E+00	2.65E-06	1.16E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	--	Crab Tissue	--	--	2.00E-03	0.00E+00	2.55E-06	2.00E-03	2.00E-03	0.00E+00	2.55E-06	2.00E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	--	Crab Tissue	4.15E-03	4.15E-03	8.72E-04	8.71E-04	3.85E-06	1.75E-03	8.72E-04	8.71E-04	3.85E-06	1.75E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	--	Crab Tissue	--	--	2.84E-05	0.00E+00	3.59E-06	3.19E-05	2.84E-05	0.00E+00	3.59E-06	3.19E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	--	Crab Tissue	--	--	1.05E-03	0.00E+00	5.72E-06	1.06E-03	1.05E-03	0.00E+00	5.72E-06	1.06E-03
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	2.73E-04	0.00E+00	3.80E-06	2.77E-04	1.56E-04	0.00E+00	3.80E-06	1.60E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	--	Crab Tissue	--	--	2.31E-03	0.00E+00	2.91E-05	2.34E-03	2.31E-03	0.00E+00	2.54E-05	2.34E-03
FLUORENE	Low	6.30E-01	3.22E-01	--	--	--	Crab Tissue	--	--	6.62E-04	0.00E+00	0.00E+00	6.62E-04	3.38E-04	0.00E+00	0.00E+00	3.38E-04
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	9.14E-04	0.00E+00	3.80E-06	9.17E-04	9.14E-04	0.00E+00	3.80E-06	9.17E-04
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	--	Crab Tissue	8.96E-04	8.96E-04	8.72E-03	1.88E-04	1.87E-05	8.92E-03	8.72E-03	1.88E-04	9.00E-06	8.91E-03
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	--	Crab Tissue	4.55E-03	4.55E-03	2.10E-03	9.56E-04	6.76E-06	3.06E-03	2.10E-03	9.56E-04	5.93E-06	3.06E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	--	Crab Tissue	--	--	1.47E-03	0.00E+00	1.61E-05	1.49E-03	1.47E-03	0.00E+00	1.61E-05	1.49E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	--	NA[B]	NA[B]	NA[B]	9.02E-03	8.71E-04	4.93E-05	9.94E-03	8.90E-03	8.71E-04	4.93E-05	9.82E-03
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	--	NA[B]	NA[B]	NA[B]	9.02E-03	8.71E-04	4.93E-05	9.94E-03	8.90E-03	8.71E-04	4.93E-05	9.82E-03
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	--	NA[B]	NA[B]	NA[B]	1.63E-02	1.56E-03	5.58E-03	2.35E-02	1.59E-02	1.56E-03	4.52E-03	2.20E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	--	NA[B]	NA[B]	NA[B]	1.63E-02	1.56E-03	5.58E-03	2.35E-02	1.59E-02	1.56E-03	4.52E-03	2.20E-02
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	--	Crab Tissue	2.22E-01	2.08E-01	4.56E-05	4.67E-02	0.00E+00	4.67E-02	4.14E-05	4.37E-02	0.00E+00	4.37E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	--	Crab Tissue	2.84E-01	2.72E-01	6.12E-05	5.97E-02	0.00E+00	5.97E-02	5.59E-05	5.72E-02	0.00E+00	5.72E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.11
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg dry wt./kg bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Fish Tissue	3.22E+01	2.95E+01	2.64E+01	6.76E+00	4.70E-03	3.31E+01	2.33E+01	6.19E+00	2.20E-03	2.95E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Fish Tissue	8.30E-02	5.96E-02	3.47E-03	1.74E-02	1.66E-05	2.09E-02	1.49E-03	1.25E-02	1.09E-05	1.40E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Fish Tissue	7.00E-01	6.66E-01	7.56E-02	1.47E-01	3.95E-04	2.23E-01	2.90E-02	1.40E-01	2.28E-04	1.69E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Fish Tissue	--	--	2.31E-03	0.00E+00	2.44E-06	2.31E-03	1.74E-03	0.00E+00	2.44E-06	1.75E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Fish Tissue	3.60E-01	3.01E-01	5.29E-01	7.56E-02	2.55E-04	6.05E-01	2.48E-01	6.32E-02	1.92E-04	3.11E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Fish Tissue	1.10E-01	9.89E-02	5.57E-02	2.31E-02	2.70E-05	7.88E-02	3.08E-02	2.08E-02	2.05E-05	5.16E-02
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Fish Tissue	3.41E+01	3.05E+01	6.25E-01	7.16E+00	1.51E-04	7.79E+00	1.81E-01	6.40E+00	1.22E-04	6.59E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Fish Tissue	1.42E+02	1.32E+02	1.26E+02	2.98E+01	1.10E-02	1.56E+02	8.02E+01	2.76E+01	5.39E-03	1.08E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Fish Tissue	7.80E-01	7.74E-01	1.34E+00	1.64E-01	2.91E-05	1.51E+00	3.68E-01	1.63E-01	1.00E-05	5.31E-01
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Fish Tissue	1.47E+01	1.42E+01	1.67E+00	3.09E+00	1.03E-02	4.77E+00	1.33E+00	2.99E+00	3.64E-03	4.33E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Fish Tissue	3.40E-02	3.40E-02	1.79E-03	7.14E-03	3.28E-06	8.93E-03	7.20E-04	7.14E-03	2.98E-06	7.86E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Fish Tissue	1.50E-01	1.36E-01	5.92E-02	3.15E-02	4.11E-04	9.11E-02	4.48E-02	2.86E-02	3.31E-04	7.37E-02
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Fish Tissue	1.80E+00	1.70E+00	1.29E-02	3.78E-01	1.27E-03	3.92E-01	4.84E-03	3.58E-01	7.00E-04	3.64E-01
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Fish Tissue	9.50E-03	9.50E-03	1.03E-03	2.00E-03	6.76E-06	3.03E-03	5.78E-04	2.00E-03	2.92E-06	2.58E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Fish Tissue	2.80E-01	2.73E-01	2.10E-01	5.88E-02	1.66E-04	2.69E-01	8.95E-02	5.73E-02	1.28E-04	1.47E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Fish Tissue	0.00E+00	0.00E+00	1.79E-01	0.00E+00	1.46E-04	1.79E-01	1.22E-01	0.00E+00	5.59E-05	1.22E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Fish Tissue	3.21E+01	3.11E+01	2.87E+00	6.74E+00	4.40E-03	9.61E+00	1.05E+00	6.53E+00	8.54E-04	7.58E+00
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Fish Tissue	--	--	3.47E-03	0.00E+00	1.04E-05	3.48E-03	1.39E-03	0.00E+00	3.52E-06	1.40E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Fish Tissue	5.00E-03	5.00E-03	6.83E-03	1.05E-03	1.82E-05	7.89E-03	2.37E-03	1.05E-03	4.56E-06	3.43E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Fish Tissue	1.10E-02	9.68E-03	6.20E-03	2.31E-03	4.70E-03	1.32E-02	3.54E-03	2.03E-03	2.20E-03	7.77E-03
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Fish Tissue	9.00E-03	8.80E-03	4.31E-02	1.89E-03	1.25E-05	4.50E-02	6.26E-03	1.85E-03	3.62E-06	8.11E-03
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Fish Tissue	--	--	2.21E-02	0.00E+00	9.36E-05	2.21E-02	9.37E-03	0.00E+00	7.12E-06	9.38E-03
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Fish Tissue	--	--	6.41E-02	0.00E+00	4.52E-04	6.45E-02	1.43E-02	0.00E+00	5.10E-05	1.44E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Fish Tissue	--	--	5.88E-02	0.00E+00	3.54E-04	5.92E-02	1.32E-02	0.00E+00	3.95E-05	1.32E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Fish Tissue	--	--	5.57E-02	0.00E+00	4.16E-04	5.61E-02	1.33E-02	0.00E+00	5.12E-05	1.33E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Fish Tissue	8.40E-04	8.40E-04	2.10E-02	1.76E-04	4.99E-04	2.17E-02	7.46E-03	1.76E-04	5.89E-05	7.70E-03
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Fish Tissue	--	--	1.89E-02	0.00E+00	4.78E-04	1.94E-02	4.77E-03	0.00E+00	5.31E-05	4.83E-03
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Fish Tissue	--	--	6.62E-02	0.00E+00	4.99E-04	6.66E-02	1.33E-02	0.00E+00	5.64E-05	1.34E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Fish Tissue	--	--	6.62E-03	0.00E+00	5.72E-04	7.19E-03	2.58E-03	0.00E+00	6.34E-05	2.64E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Fish Tissue	5.90E-02	5.10E-02	1.47E-01	1.24E-02	2.44E-04	1.60E-01	3.17E-02	1.07E-02	2.25E-05	4.25E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Fish Tissue	3.20E-03	3.20E-03	2.63E-02	6.72E-04	5.15E-04	2.74E-02	7.32E-03	6.72E-04	6.01E-05	8.05E-03
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Fish Tissue	1.90E-02	1.82E-02	7.56E+00	3.99E-03	3.48E-04	7.56E+00	2.26E+00	3.83E-03	6.61E-05	2.26E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Fish Tissue	1.00E-02	9.69E-03	2.10E-02	2.10E-03	6.24E-05	2.32E-02	1.54E-02	2.03E-03	7.44E-06	1.74E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Fish Tissue	5.40E-03	5.40E-03	6.20E-02	1.13E-03	2.44E-04	6.33E-02	1.65E-02	1.13E-03	2.37E-05	1.76E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	3.79E-01	1.98E-03	4.03E-03	3.85E-01	9.27E-02	1.98E-03	4.57E-04	9.51E-02
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	7.81E+00	2.37E-02	5.49E-03	7.84E+00	2.33E+00	2.15E-02	2.32E-03	2.35E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Fish Tissue	5.37E-01	5.20E-01	4.83E-04	1.13E-01	0.00E+00	1.13E-01	1.89E-04	1.09E-01	0.00E+00	1.09E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Fish Tissue	5.57E-01	5.40E-01	5.13E-04	1.17E-01	0.00E+00	1.17E-01	2.78E-04	1.13E-01	0.00E+00	1.14E-01

TABLE C.11
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg dry wt./kg bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (g wet wt./g bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
VOLATILES																	
1,2-DICHLOROBENZENE	--	--	--	2.90E-03	2.90E-03	8.51E+01	SWBAF	2.47E-01	2.47E-01	0.00E+00	5.18E-02	1.51E-04	5.20E-02	0.00E+00	5.18E-02	1.51E-04	5.20E-02
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.18E+01	SWBAF	8.50E-01	1.47E-01	8.30E-05	1.78E-01	3.74E-03	1.82E-01	8.30E-05	3.09E-02	6.49E-04	3.17E-02
CHLOROFORM	--	--	--	1.00E-03	1.00E-03	9.26E+00	SWBAF	9.26E-03	9.26E-03	0.00E+00	1.94E-03	5.20E-05	2.00E-03	0.00E+00	1.94E-03	5.20E-05	2.00E-03
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	5.56E+01	SWBAF	2.22E+00	1.44E-01	5.15E-06	4.67E-01	2.08E-03	4.69E-01	5.15E-06	3.03E-02	1.35E-04	3.04E-02
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	2.94E+01	SWBAF	4.41E-01	8.20E-02	5.99E-05	9.26E-02	7.80E-04	9.34E-02	5.99E-05	1.72E-02	1.45E-04	1.74E-02
TOTAL XYLENES	--	--	--	6.50E-03	4.44E-03	5.32E+01	SWBAF	3.46E-01	2.36E-01	0.00E+00	7.26E-02	3.38E-04	7.30E-02	0.00E+00	4.96E-02	2.31E-04	4.98E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.12
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS BIRDS (OSPREY) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Sediment Ingestion Rate (g dry wt./g bw-day):	1.05E-03	g/g-day
Food Ingestion Rate (kg wet wt./kg bw-day):	2.10E-01	g/g-day
Water Ingestion Rate (g/g bw-day):	5.20E-02	g/g-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Fish) Uptake			Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	Fish Tissue	8.36E+01	6.93E+01	2.14E+01	1.76E+01	5.51E-03	3.90E+01	2.14E+01	1.46E+01	4.47E-03	3.60E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	Fish Tissue	6.90E-02	5.27E-02	1.79E-03	1.45E-02	1.56E-05	1.63E-02	1.79E-03	1.11E-02	1.32E-05	1.29E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	Fish Tissue	8.10E-01	8.02E-01	1.70E-02	1.70E-01	3.33E-04	1.87E-01	1.12E-02	1.68E-01	2.44E-04	1.80E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	Fish Tissue	--	--	1.79E-03	0.00E+00	1.98E-06	1.79E-03	1.79E-03	0.00E+00	1.98E-06	1.79E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	Fish Tissue	6.80E-01	6.80E-01	2.36E-01	1.43E-01	7.38E-04	3.80E-01	2.15E-01	1.43E-01	6.53E-04	3.58E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	Fish Tissue	1.10E-01	1.07E-01	2.08E-02	2.31E-02	3.54E-05	4.39E-02	2.08E-02	2.24E-02	2.51E-05	4.32E-02
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	Fish Tissue	2.57E+01	2.30E+01	1.10E-01	5.40E+00	1.35E-04	5.51E+00	9.62E-02	4.83E+00	1.22E-04	4.93E+00
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	Fish Tissue	1.26E+02	1.08E+02	4.60E+01	2.65E+01	1.28E-02	7.25E+01	2.88E+01	2.27E+01	8.02E-03	5.15E+01
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	Fish Tissue	4.10E-01	3.82E-01	1.27E-01	8.61E-02	2.39E-05	2.13E-01	1.11E-01	8.03E-02	1.83E-05	1.91E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	Fish Tissue	2.38E+01	2.04E+01	1.32E+00	5.00E+00	4.44E-03	6.33E+00	1.32E+00	4.29E+00	4.23E-03	5.61E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	Fish Tissue	4.50E-02	3.82E-02	4.10E-04	9.45E-03	2.03E-06	9.86E-03	2.38E-04	8.02E-03	2.03E-06	8.26E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	Fish Tissue	2.40E-01	2.25E-01	3.93E-02	5.04E-02	3.43E-04	9.00E-02	2.57E-02	4.72E-02	2.94E-04	7.32E-02
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	Fish Tissue	1.40E+00	1.35E+00	2.52E-03	2.94E-01	8.89E-04	2.97E-01	2.52E-03	2.83E-01	6.54E-04	2.86E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	Fish Tissue	--	--	2.94E-04	0.00E+00	5.20E-06	2.99E-04	2.94E-04	0.00E+00	4.74E-06	2.99E-04
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	Fish Tissue	2.90E-01	2.86E-01	4.04E-02	6.09E-02	1.92E-04	1.02E-01	4.04E-02	6.02E-02	1.92E-04	1.01E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	Fish Tissue	--	--	9.91E-02	0.00E+00	1.09E-04	9.92E-02	9.91E-02	0.00E+00	7.92E-05	9.92E-02
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	Fish Tissue	2.43E+01	2.41E+01	4.50E-01	5.10E+00	4.68E-04	5.55E+00	3.95E-01	5.07E+00	3.45E-04	5.46E+00
PAHS																
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	Fish Tissue	--	--	3.47E-04	0.00E+00	3.48E-06	3.50E-04	3.47E-04	0.00E+00	3.48E-06	3.50E-04
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	Fish Tissue	4.40E-03	4.40E-03	6.62E-04	9.24E-04	7.80E-06	1.59E-03	6.03E-04	9.24E-04	6.40E-06	1.53E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	Fish Tissue	5.10E-03	5.10E-03	4.62E-04	1.07E-03	5.51E-03	7.05E-03	4.62E-04	1.07E-03	4.47E-03	6.00E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	Fish Tissue	--	--	6.83E-04	0.00E+00	1.25E-06	6.84E-04	6.22E-04	0.00E+00	1.25E-06	6.23E-04
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	Fish Tissue	--	--	1.26E-03	0.00E+00	7.28E-06	1.27E-03	1.26E-03	0.00E+00	7.28E-06	1.27E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	Fish Tissue	--	--	1.16E-03	0.00E+00	2.65E-06	1.16E-03	1.16E-03	0.00E+00	2.65E-06	1.16E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	Fish Tissue	--	--	2.00E-03	0.00E+00	2.55E-06	2.00E-03	2.00E-03	0.00E+00	2.55E-06	2.00E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	Fish Tissue	--	--	8.72E-04	0.00E+00	3.85E-06	8.75E-04	8.72E-04	0.00E+00	3.85E-06	8.75E-04
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	Fish Tissue	--	--	2.84E-05	0.00E+00	3.59E-06	3.19E-05	2.84E-05	0.00E+00	3.59E-06	3.19E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	Fish Tissue	--	--	1.05E-03	0.00E+00	5.72E-06	1.06E-03	1.05E-03	0.00E+00	5.72E-06	1.06E-03
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	2.73E-04	0.00E+00	3.80E-06	2.77E-04	1.56E-04	0.00E+00	3.80E-06	1.60E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	Fish Tissue	--	--	2.31E-03	0.00E+00	2.91E-05	2.34E-03	2.31E-03	0.00E+00	2.54E-05	2.34E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	9.14E-04	0.00E+00	3.80E-06	9.17E-04	9.14E-04	0.00E+00	3.80E-06	9.17E-04
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	Fish Tissue	--	--	8.72E-03	0.00E+00	1.87E-05	8.73E-03	8.72E-03	0.00E+00	9.00E-06	8.72E-03
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	Fish Tissue	1.00E-02	9.68E-03	2.10E-03	2.10E-03	6.76E-06	4.21E-03	2.10E-03	2.03E-03	5.93E-06	4.14E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	Fish Tissue	--	--	1.47E-03	0.00E+00	1.61E-05	1.49E-03	1.47E-03	0.00E+00	1.61E-05	1.49E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	Fish Tissue	NA[B]	NA[B]	9.02E-03	0.00E+00	4.93E-05	9.07E-03	8.90E-03	0.00E+00	4.93E-05	8.95E-03
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	Fish Tissue	NA[B]	NA[B]	9.02E-03	0.00E+00	4.93E-05	9.07E-03	8.90E-03	0.00E+00	4.93E-05	8.95E-03
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	Fish Tissue	NA[B]	NA[B]	1.53E-02	4.10E-03	5.58E-03	2.50E-02	1.52E-02	4.03E-03	4.52E-03	2.37E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	Fish Tissue	NA[B]	NA[B]	1.53E-02	4.10E-03	5.58E-03	2.50E-02	1.52E-02	4.03E-03	4.52E-03	2.37E-02
PCBS																
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	Fish Tissue	4.54E-01	4.54E-01	4.56E-05	9.53E-02	0.00E+00	9.54E-02	4.14E-05	9.53E-02	0.00E+00	9.54E-02
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	Fish Tissue	4.74E-01	4.74E-01	6.12E-05	9.95E-02	0.00E+00	9.96E-02	5.59E-05	9.95E-02	0.00E+00	9.96E-02

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.13
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	7.82E-06	1.32E-06	0.00E+00	9.14E-06	1.46E-06	2.45E-07	0.00E+00	1.70E-06
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	7.14E-07	3.84E-07	0.00E+00	1.10E-06	2.18E-07	1.18E-07	0.00E+00	3.36E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	6.80E-08	4.81E-08	0.00E+00	1.16E-07	3.34E-08	2.36E-08	0.00E+00	5.70E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	2.72E-08	6.22E-08	0.00E+00	8.94E-08	1.06E-08	2.42E-08	0.00E+00	3.47E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	1.22E-07	1.02E-06	0.00E+00	1.14E-06	5.13E-08	4.28E-07	0.00E+00	4.79E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	2.35E-07	2.46E-06	0.00E+00	2.69E-06	7.33E-08	7.67E-07	0.00E+00	8.40E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	4.42E-08	3.69E-07	0.00E+00	4.13E-07	2.64E-08	2.20E-07	0.00E+00	2.47E-07
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	1.22E-07	1.19E-07	0.00E+00	2.42E-07	4.13E-08	4.03E-08	0.00E+00	8.16E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	4.76E-09	9.13E-08	0.00E+00	9.61E-08	3.49E-09	6.69E-08	0.00E+00	7.03E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	3.74E-08	1.39E-06	0.00E+00	1.43E-06	1.32E-08	4.90E-07	0.00E+00	5.04E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	4.42E-08	2.38E-08	0.00E+00	6.80E-08	2.44E-08	1.31E-08	0.00E+00	3.75E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	4.08E-08	3.40E-07	0.00E+00	3.81E-07	1.98E-08	1.65E-07	0.00E+00	1.85E-07
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	4.76E-08	1.75E-06	0.00E+00	1.80E-06	2.64E-08	9.69E-07	0.00E+00	9.96E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	1.46E-08	6.87E-07	0.00E+00	7.02E-07	5.86E-09	2.75E-07	0.00E+00	2.81E-07
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	9.86E-08	3.60E-06	0.00E+00	3.70E-06	3.95E-08	1.44E-06	0.00E+00	1.48E-06
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	1.12E-04	9.44E-06	0.00E+00	1.22E-04	2.26E-05	1.90E-06	0.00E+00	2.45E-05
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	2.99E-06	6.65E-06	0.00E+00	9.64E-06	9.07E-07	2.01E-06	0.00E+00	2.92E-06
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	2.58E-07	3.43E-06	0.00E+00	3.69E-06	7.84E-08	1.38E-06	0.00E+00	1.46E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	2.86E-01	5.71E+01	0.00E+00	5.74E+01	1.14E-01	2.29E+01	0.00E+00	2.30E+01
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	4.00E-03	Benthic Tissue	1.00E+02	8.87E+01	8.53E+01	6.83E+01	7.50E-03	1.54E+02	7.54E+01	6.03E+01	3.51E-03	1.36E+02
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	3.15E-02	Benthic Tissue	1.04E-01	4.47E-02	1.12E-02	7.06E-02	2.66E-05	8.18E-02	4.83E-03	3.04E-02	1.73E-05	3.52E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	5.41E-02	Benthic Tissue	3.89E+00	1.49E+00	2.45E-01	2.65E+00	6.31E-04	2.89E+00	9.40E-02	1.02E+00	3.64E-04	1.11E+00
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	7.48E-03	0.00E+00	3.90E-06	7.48E-03	5.64E-03	0.00E+00	3.90E-06	5.65E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	7.76E-03	Benthic Tissue	5.97E-02	2.30E-02	2.62E-02	4.06E-02	0.00E+00	6.68E-02	1.01E-02	1.57E-02	0.00E+00	2.57E-02
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	4.68E-03	Benthic Tissue	2.36E+00	1.11E+00	1.71E+00	1.60E+00	4.07E-04	3.32E+00	8.03E-01	7.52E-01	3.07E-04	1.55E+00
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	9.67E-03	Benthic Tissue	5.12E-01	2.84E-01	1.80E-01	3.48E-01	4.32E-05	5.29E-01	9.98E-02	1.93E-01	3.27E-05	2.93E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	7.75E-03	Benthic Tissue	4.61E+00	1.33E+00	2.02E+00	3.14E+00	2.41E-04	5.16E+00	5.85E-01	9.06E-01	1.94E-04	1.49E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	4.63E-03	Benthic Tissue	5.56E+02	3.54E+02	4.08E+02	3.78E+02	1.76E-02	7.86E+02	2.60E+02	2.41E+02	8.61E-03	5.00E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	3.62E-03	Benthic Tissue	4.64E+00	1.27E+00	4.35E+00	3.15E+00	4.65E-05	7.51E+00	1.19E+00	8.64E-01	1.60E-05	2.06E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	5.47E-03	Benthic Tissue	8.69E+00	6.94E+00	5.41E+00	5.91E+00	1.64E-02	1.13E+01	4.32E+00	4.72E+00	5.82E-03	9.04E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	1.43E-02	Benthic Tissue	2.44E-02	9.83E-03	5.78E-03	1.66E-02	5.23E-06	2.23E-02	2.33E-03	6.68E-03	4.76E-06	9.02E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	1.14E-02	Benthic Tissue	6.42E-01	4.86E-01	1.92E-01	4.36E-01	6.56E-04	6.29E-01	1.45E-01	3.30E-01	5.28E-04	4.76E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	5.24E-02	Benthic Tissue	6.45E-01	2.42E-01	4.18E-02	4.39E-01	2.03E-03	4.83E-01	1.57E-02	1.65E-01	1.12E-03	1.81E-01
SILVER	--	2.80E+00	1.39E+00	--	--	2.02E-02	Benthic Tissue	5.66E-02	2.80E-02	9.52E-03	3.85E-02	0.00E+00	4.80E-02	4.71E-03	1.91E-02	0.00E+00	2.38E-02
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	1.39E-02	Benthic Tissue	1.36E-02	7.64E-03	3.33E-03	9.26E-03	1.08E-05	1.26E-02	1.87E-03	5.20E-03	4.66E-06	7.07E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	8.48E-03	Benthic Tissue	1.70E+00	7.23E-01	6.80E-01	1.15E+00	2.66E-04	1.83E+00	2.90E-01	4.91E-01	2.04E-04	7.81E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	5.41E-02	Benthic Tissue	9.19E+00	6.28E+00	5.78E-01	6.25E+00	2.32E-04	6.83E+00	3.95E-01	4.27E+00	8.92E-05	4.67E+00
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	2.45E-02	Benthic Tissue	6.68E+01	2.44E+01	9.28E+00	4.54E+01	7.02E-03	5.47E+01	3.40E+00	1.66E+01	1.36E-03	2.00E+01

TABLE C.13
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	1.69E-01	Benthic Tissue	5.58E-01	2.24E-01	1.12E-02	3.80E-01	1.66E-05	3.91E-01	4.51E-03	1.53E-01	5.62E-06	1.57E-01
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	3.50E-02	Benthic Tissue	2.28E-01	7.91E-02	2.21E-02	1.55E-01	2.91E-05	1.77E-01	7.68E-03	5.38E-02	7.28E-06	6.15E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	8.48E-02	Benthic Tissue	5.00E-01	2.85E-01	2.01E-02	3.40E-01	7.50E-03	3.68E-01	1.14E-02	1.94E-01	3.51E-03	2.09E-01
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	5.02E-02	Benthic Tissue	2.06E+00	3.00E-01	1.39E-01	1.40E+00	1.99E-05	1.54E+00	2.03E-02	2.04E-01	5.78E-06	2.24E-01
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	8.24E-02	Benthic Tissue	1.73E+00	7.35E-01	7.14E-02	1.18E+00	1.49E-04	1.25E+00	3.03E-02	5.00E-01	1.14E-05	5.30E-01
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	1.49E-01	Benthic Tissue	9.12E+00	2.04E+00	2.07E-01	6.20E+00	7.22E-04	6.41E+00	4.64E-02	1.39E+00	8.13E-05	1.43E+00
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	7.31E-02	Benthic Tissue	4.09E+00	9.17E-01	1.90E-01	2.78E+00	5.64E-04	2.97E+00	4.26E-02	6.23E-01	6.30E-05	6.66E-01
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	4.74E-02	Benthic Tissue	2.51E+00	6.00E-01	1.80E-01	1.71E+00	6.64E-04	1.89E+00	4.30E-02	4.08E-01	8.17E-05	4.51E-01
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	2.33E-02	Benthic Tissue	4.65E-01	1.65E-01	6.80E-02	3.16E-01	7.97E-04	3.85E-01	2.42E-02	1.12E-01	9.40E-05	1.37E-01
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	6.12E-02	0.00E+00	7.64E-04	6.20E-02	1.55E-02	0.00E+00	8.47E-05	1.55E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	1.45E-01	Benthic Tissue	9.16E+00	1.84E+00	2.14E-01	6.23E+00	7.97E-04	6.45E+00	4.31E-02	1.25E+00	9.01E-05	1.30E+00
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	1.78E-01	Benthic Tissue	1.12E+00	4.37E-01	2.14E-02	7.62E-01	9.13E-04	7.84E-01	8.35E-03	2.97E-01	1.01E-04	3.05E-01
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	3.10E-01	Benthic Tissue	4.34E+01	9.37E+00	4.76E-01	2.95E+01	3.90E-04	3.00E+01	1.03E-01	6.37E+00	3.59E-05	6.47E+00
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	2.79E-02	Benthic Tissue	1.26E-01	8.12E-02	1.53E-02	8.55E-02	1.25E-05	1.01E-01	9.88E-03	5.52E-02	5.04E-06	6.51E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	5.66E-02	Benthic Tissue	1.41E+00	3.94E-01	8.50E-02	9.62E-01	8.22E-04	1.05E+00	2.37E-02	2.68E-01	9.59E-05	2.92E-01
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	1.75E-02	Benthic Tissue	1.26E+02	3.76E+01	2.45E+01	8.56E+01	5.56E-04	1.10E+02	7.31E+00	2.55E+01	1.05E-04	3.29E+01
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	7.59E-02	Benthic Tissue	1.52E+00	1.11E+00	6.80E-02	1.03E+00	9.96E-05	1.10E+00	4.98E-02	7.56E-01	1.19E-05	8.06E-01
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	3.45E-01	Benthic Tissue	2.04E+01	5.41E+00	2.01E-01	1.39E+01	3.90E-04	1.41E+01	5.33E-02	3.68E+00	3.78E-05	3.73E+00
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.23E+00	3.28E+01	6.43E-03	3.41E+01	3.00E-01	8.03E+00	7.30E-04	8.33E+00
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.53E+01	1.20E+02	8.78E-03	1.45E+02	7.54E+00	3.38E+01	3.70E-03	4.14E+01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	6.35E+00	Benthic Tissue	2.92E+00	1.14E+00	1.57E-03	1.99E+00	0.00E+00	1.99E+00	6.12E-04	7.77E-01	0.00E+00	7.77E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	6.90E+00	Benthic Tissue	3.37E+00	1.83E+00	1.66E-03	2.29E+00	0.00E+00	2.30E+00	9.01E-04	1.24E+00	0.00E+00	1.24E+00
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	6.46E-05	1.56E-02	0.00E+00	1.57E-02	6.46E-05	1.56E-02	0.00E+00	1.57E-02
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	2.69E-04	5.37E-02	5.98E-03	6.00E-02	2.69E-04	5.37E-02	1.04E-03	5.50E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	1.67E-05	3.33E-03	3.32E-03	6.67E-03	1.67E-05	3.33E-03	2.15E-04	3.56E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	1.94E-04	3.88E-02	1.25E-03	4.02E-02	1.94E-04	3.88E-02	2.31E-04	3.92E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.14
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	1.46E-06	2.46E-07	0.00E+00	1.71E-06	9.00E-07	1.51E-07	0.00E+00	1.05E-06
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	3.23E-07	1.74E-07	0.00E+00	4.97E-07	1.73E-07	9.32E-08	0.00E+00	2.66E-07
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	7.14E-08	5.05E-08	0.00E+00	1.22E-07	7.14E-08	5.05E-08	0.00E+00	1.22E-07
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	1.60E-08	3.66E-08	0.00E+00	5.25E-08	1.60E-08	3.66E-08	0.00E+00	5.25E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	1.36E-07	1.13E-06	0.00E+00	1.27E-06	1.36E-07	1.13E-06	0.00E+00	1.27E-06
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	1.02E-07	1.07E-06	0.00E+00	1.17E-06	1.02E-07	1.07E-06	0.00E+00	1.17E-06
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	3.74E-08	3.12E-07	0.00E+00	3.50E-07	3.74E-08	3.12E-07	0.00E+00	3.50E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	6.80E-08	6.64E-08	0.00E+00	1.34E-07	6.80E-08	6.64E-08	0.00E+00	1.34E-07
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	1.19E-08	2.28E-07	0.00E+00	2.40E-07	1.19E-08	2.28E-07	0.00E+00	2.40E-07
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	1.33E-08	4.94E-07	0.00E+00	5.07E-07	1.33E-08	4.94E-07	0.00E+00	5.07E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	6.46E-08	3.48E-08	0.00E+00	9.94E-08	6.46E-08	3.48E-08	0.00E+00	9.94E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	1.84E-08	1.53E-07	0.00E+00	1.72E-07	1.84E-08	1.53E-07	0.00E+00	1.72E-07
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	3.74E-08	1.37E-06	0.00E+00	1.41E-06	3.74E-08	1.37E-06	0.00E+00	1.41E-06
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	4.76E-08	1.74E-06	0.00E+00	1.79E-06	2.59E-08	9.47E-07	0.00E+00	9.73E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	3.74E-05	3.15E-06	0.00E+00	4.05E-05	3.60E-05	3.03E-06	0.00E+00	3.91E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	2.92E-07	6.49E-07	0.00E+00	9.42E-07	2.45E-07	5.45E-07	0.00E+00	7.90E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	1.00E-07	1.39E-06	0.00E+00	1.49E-06	9.03E-08	1.31E-06	0.00E+00	1.40E-06
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	1.00E-07	1.39E-06	0.00E+00	1.49E-06	9.03E-08	1.31E-06	0.00E+00	1.40E-06
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	4.00E-03	Benthic Tissue	8.16E+01	8.16E+01	6.94E+01	5.55E+01	8.80E-03	1.25E+02	6.94E+01	5.55E+01	7.13E-03	1.25E+02
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	3.15E-02	Benthic Tissue	5.35E-02	5.35E-02	5.78E-03	3.64E-02	2.49E-05	4.22E-02	5.78E-03	3.64E-02	2.10E-05	4.22E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	5.41E-02	Benthic Tissue	8.76E-01	5.79E-01	5.51E-02	5.96E-01	5.31E-04	6.51E-01	3.64E-02	3.94E-01	3.89E-04	4.31E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	5.78E-03	0.00E+00	3.15E-06	5.78E-03	5.78E-03	0.00E+00	3.15E-06	5.78E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	7.76E-03	Benthic Tissue	1.24E-02	1.05E-02	5.44E-03	8.44E-03	0.00E+00	1.39E-02	4.58E-03	7.11E-03	0.00E+00	1.17E-02
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	4.68E-03	Benthic Tissue	1.05E+00	9.56E-01	7.65E-01	7.16E-01	1.18E-03	1.48E+00	6.95E-01	6.50E-01	1.04E-03	1.35E+00
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	9.67E-03	Benthic Tissue	1.91E-01	1.91E-01	6.73E-02	1.30E-01	5.64E-05	1.98E-01	6.73E-02	1.30E-01	4.01E-05	1.98E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	7.75E-03	Benthic Tissue	8.14E-01	7.10E-01	3.57E-01	5.53E-01	2.16E-04	9.10E-01	3.11E-01	4.83E-01	1.95E-04	7.94E-01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	4.63E-03	Benthic Tissue	2.03E+02	1.27E+02	1.49E+02	1.38E+02	2.04E-02	2.87E+02	9.32E+01	8.64E+01	1.28E-02	1.80E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	3.62E-03	Benthic Tissue	4.39E-01	3.83E-01	4.11E-01	2.98E-01	3.82E-05	7.10E-01	3.59E-01	2.60E-01	2.92E-05	6.20E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	5.47E-03	Benthic Tissue	6.89E+00	6.89E+00	4.28E+00	4.68E+00	7.09E-03	8.97E+00	4.28E+00	4.68E+00	6.76E-03	8.97E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	1.43E-02	Benthic Tissue	5.59E-03	3.25E-03	1.33E-03	3.80E-03	3.24E-06	5.13E-03	7.72E-04	2.21E-03	3.24E-06	2.99E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	1.14E-02	Benthic Tissue	4.26E-01	2.79E-01	1.27E-01	2.89E-01	5.48E-04	4.17E-01	8.34E-02	1.90E-01	4.70E-04	2.74E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	5.24E-02	Benthic Tissue	1.26E-01	1.26E-01	8.16E-03	8.56E-02	1.42E-03	9.52E-02	8.16E-03	8.56E-02	1.04E-03	9.48E-02
SILVER	--	9.40E-01	8.58E-01	--	--	2.02E-02	Benthic Tissue	1.90E-02	1.74E-02	3.20E-03	1.29E-02	0.00E+00	1.61E-02	2.92E-03	1.18E-02	0.00E+00	1.47E-02
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	1.39E-02	Benthic Tissue	3.89E-03	3.89E-03	9.52E-04	2.65E-03	8.30E-06	3.61E-03	9.52E-04	2.65E-03	7.56E-06	3.61E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	8.48E-03	Benthic Tissue	3.26E-01	3.26E-01	1.31E-01	2.22E-01	3.07E-04	3.53E-01	1.31E-01	2.22E-01	3.07E-04	3.53E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	5.41E-02	Benthic Tissue	5.11E+00	5.11E+00	3.21E-01	3.47E+00	1.74E-04	3.79E+00	3.21E-01	3.47E+00	1.26E-04	3.79E+00
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	2.45E-02	Benthic Tissue	1.05E+01	9.20E+00	1.46E+00	7.14E+00	7.47E-04	8.60E+00	1.28E+00	6.25E+00	5.51E-04	7.53E+00
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	1.69E-01	Benthic Tissue	5.58E-02	5.58E-02	1.12E-03	3.80E-02	5.56E-06	3.91E-02	1.12E-03	3.80E-02	5.56E-06	3.91E-02
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	3.50E-02	Benthic Tissue	2.21E-02	2.01E-02	2.14E-03	1.50E-02	1.25E-05	1.71E-02	1.95E-03	1.37E-02	1.02E-05	1.56E-02
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	8.48E-02	Benthic Tissue	3.73E-02	3.73E-02	1.50E-03	2.54E-02	8.80E-03	3.57E-02	1.50E-03	2.54E-02	7.13E-03	3.40E-02
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	5.02E-02	Benthic Tissue	1.91E-02	1.91E-02	1.29E-03	1.30E-02	0.00E+00	1.43E-02	1.29E-03	1.30E-02	0.00E+00	1.43E-02
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	8.24E-02	Benthic Tissue	5.35E-02	4.88E-02	2.21E-03	3.64E-02	1.99E-06	3.86E-02	2.01E-03	3.32E-02	1.99E-06	3.52E-02
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	1.49E-01	Benthic Tissue	1.79E-01	1.79E-01	4.08E-03	1.22E-01	1.16E-05	1.26E-01	4.08E-03	1.22E-01	1.16E-05	1.26E-01
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	7.31E-02	Benthic Tissue	8.04E-02	8.04E-02	3.74E-03	5.47E-02	4.23E-06	5.84E-02	3.74E-03	5.47E-02	4.23E-06	5.84E-02
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	4.74E-02	Benthic Tissue	9.00E-02	9.00E-02	6.46E-03	6.12E-02	4.07E-06	6.77E-02	6.46E-03	6.12E-02	4.07E-06	6.77E-02
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	2.33E-02	Benthic Tissue	1.93E-02	1.93E-02	2.82E-03	1.31E-02	6.14E-06	1.60E-02	2.82E-03	1.31E-02	6.14E-06	1.60E-02
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	9.18E-05	0.00E+00	5.73E-06	9.75E-05	9.18E-05	0.00E+00	5.73E-06	9.75E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	1.45E-01	Benthic Tissue	1.45E-01	1.45E-01	3.40E-03	9.89E-02	9.13E-06	1.02E-01	3.40E-03	9.89E-02	9.13E-06	1.02E-01
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	1.78E-01	Benthic Tissue	4.62E-02	2.65E-02	8.84E-04	3.14E-02	6.06E-06	3.23E-02	5.07E-04	1.80E-02	6.06E-06	1.85E-02
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	3.10E-01	Benthic Tissue	6.82E-01	6.82E-01	7.48E-03	4.64E-01	4.65E-05	4.71E-01	7.48E-03	4.64E-01	4.05E-05	4.71E-01
FLUORENE	Low	6.30E-01	3.22E-01	--	--	2.79E-02	Benthic Tissue	1.76E-02	8.99E-03	2.14E-03	1.20E-02	0.00E+00	1.41E-02	1.09E-03	6.12E-03	0.00E+00	7.21E-03

TABLE C.14
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	5.66E-02	Benthic Tissue	4.92E-02	4.92E-02	2.96E-03	3.35E-02	6.06E-06	3.64E-02	2.96E-03	3.35E-02	6.06E-06	3.64E-02
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	1.75E-02	Benthic Tissue	1.45E-01	1.45E-01	2.82E-02	9.87E-02	2.99E-05	1.27E-01	2.82E-02	9.87E-02	1.44E-05	1.27E-01
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	7.59E-02	Benthic Tissue	1.52E-01	1.52E-01	6.80E-03	1.03E-01	1.08E-05	1.10E-01	6.80E-03	1.03E-01	9.46E-06	1.10E-01
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	3.45E-01	Benthic Tissue	4.84E-01	4.84E-01	4.76E-03	3.29E-01	2.57E-05	3.34E-01	4.76E-03	3.29E-01	2.57E-05	3.34E-01
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	NA[B]	NA[B]	NA	NA	2.92E-02	7.44E-01	7.88E-05	7.73E-01	2.88E-02	7.30E-01	7.88E-05	7.59E-01
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	NA[B]	NA[B]	NA	NA	2.92E-02	7.44E-01	7.88E-05	7.73E-01	2.88E-02	7.30E-01	7.88E-05	7.59E-01
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	NA[B]	NA[B]	NA	NA	5.29E-02	8.05E-01	8.91E-03	8.67E-01	5.15E-02	7.95E-01	7.21E-03	8.53E-01
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	NA[B]	NA[B]	NA	NA	5.29E-02	8.05E-01	8.91E-03	8.67E-01	5.15E-02	7.95E-01	7.21E-03	8.53E-01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	6.35E+00	Benthic Tissue	2.75E-01	2.50E-01	1.48E-04	1.87E-01	0.00E+00	1.87E-01	1.34E-04	1.70E-01	0.00E+00	1.70E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	6.90E+00	Benthic Tissue	4.02E-01	3.67E-01	1.98E-04	2.74E-01	0.00E+00	2.74E-01	1.81E-04	2.50E-01	0.00E+00	2.50E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.15
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	7.82E-06	1.32E-06	0.00E+00	9.14E-06	1.46E-06	2.45E-07	0.00E+00	1.70E-06
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	7.14E-07	3.84E-07	0.00E+00	1.10E-06	2.18E-07	1.18E-07	0.00E+00	3.36E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	6.80E-08	4.81E-08	0.00E+00	1.16E-07	3.34E-08	2.36E-08	0.00E+00	5.70E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	2.72E-08	6.22E-08	0.00E+00	8.94E-08	1.06E-08	2.42E-08	0.00E+00	3.47E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	1.22E-07	1.02E-06	0.00E+00	1.14E-06	5.13E-08	4.28E-07	0.00E+00	4.79E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	2.35E-07	2.46E-06	0.00E+00	2.69E-06	7.33E-08	7.67E-07	0.00E+00	8.40E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	4.42E-08	3.69E-07	0.00E+00	4.13E-07	2.64E-08	2.20E-07	0.00E+00	2.47E-07
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	1.22E-07	1.19E-07	0.00E+00	2.42E-07	4.13E-08	4.03E-08	0.00E+00	8.16E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	4.76E-09	9.13E-08	0.00E+00	9.61E-08	3.49E-09	6.69E-08	0.00E+00	7.03E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	3.74E-08	1.39E-06	0.00E+00	1.43E-06	1.32E-08	4.90E-07	0.00E+00	5.04E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	4.42E-08	2.38E-08	0.00E+00	6.80E-08	2.44E-08	1.31E-08	0.00E+00	3.75E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	4.08E-08	3.40E-07	0.00E+00	3.81E-07	1.98E-08	1.65E-07	0.00E+00	1.85E-07
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	4.76E-08	1.75E-06	0.00E+00	1.80E-06	2.64E-08	9.69E-07	0.00E+00	9.96E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	1.46E-08	6.87E-07	0.00E+00	7.02E-07	5.86E-09	2.75E-07	0.00E+00	2.81E-07
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	9.86E-08	3.60E-06	0.00E+00	3.70E-06	3.95E-08	1.44E-06	0.00E+00	1.48E-06
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	1.12E-04	9.44E-06	0.00E+00	1.22E-04	2.26E-05	1.90E-06	0.00E+00	2.45E-05
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	2.99E-06	6.65E-06	0.00E+00	9.64E-06	9.07E-07	2.01E-06	0.00E+00	2.92E-06
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	2.58E-07	3.43E-06	0.00E+00	3.69E-06	7.84E-08	1.38E-06	0.00E+00	1.46E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	2.86E-01	5.71E+01	0.00E+00	5.74E+01	1.14E-01	2.29E+01	0.00E+00	2.30E+01
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Crab Tissue	7.20E+00	6.46E+00	8.53E+01	4.90E+00	7.50E-03	9.02E+01	7.54E+01	4.40E+00	3.51E-03	7.98E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Crab Tissue	3.91E-02	3.39E-02	1.12E-02	2.66E-02	2.66E-05	3.79E-02	4.83E-03	2.31E-02	1.73E-05	2.79E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Crab Tissue	1.24E+00	1.22E+00	2.45E-01	8.45E-01	6.31E-04	1.09E+00	9.40E-02	8.27E-01	3.64E-04	9.21E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Crab Tissue	--	--	7.48E-03	0.00E+00	3.90E-06	7.48E-03	5.64E-03	0.00E+00	3.90E-06	5.65E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	--	Crab Tissue	1.58E-01	1.51E-01	2.62E-02	1.08E-01	0.00E+00	1.34E-01	1.01E-02	1.03E-01	0.00E+00	1.13E-01
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Crab Tissue	2.12E-01	1.96E-01	1.71E+00	1.44E-01	4.07E-04	1.86E+00	8.03E-01	1.33E-01	3.07E-04	9.36E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Crab Tissue	1.38E-01	1.26E-01	1.80E-01	9.41E-02	4.32E-05	2.74E-01	9.98E-02	8.55E-02	3.27E-05	1.85E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Crab Tissue	1.25E+01	1.07E+01	2.02E+00	8.49E+00	2.41E-04	1.05E+01	5.85E-01	7.30E+00	1.94E-04	7.88E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Crab Tissue	5.01E+01	4.47E+01	4.08E+02	3.41E+01	1.76E-02	4.42E+02	2.60E+02	3.04E+01	8.61E-03	2.90E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Crab Tissue	1.71E-01	1.51E-01	4.35E+00	1.16E-01	4.65E-05	4.47E+00	1.19E+00	1.02E-01	1.60E-05	1.29E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Crab Tissue	1.10E+01	8.76E+00	5.41E+00	7.50E+00	1.64E-02	1.29E+01	4.32E+00	5.96E+00	5.82E-03	1.03E+01
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Crab Tissue	2.10E-02	1.91E-02	5.78E-03	1.43E-02	5.23E-06	2.00E-02	2.33E-03	1.30E-02	4.76E-06	1.53E-02
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Crab Tissue	1.95E-01	1.88E-01	1.92E-01	1.33E-01	6.56E-04	3.25E-01	1.45E-01	1.28E-01	5.28E-04	2.74E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Crab Tissue	1.07E+00	1.00E+00	4.18E-02	7.31E-01	2.03E-03	7.75E-01	1.57E-02	6.81E-01	1.12E-03	6.98E-01
SILVER	--	2.80E+00	1.39E+00	--	--	--	Crab Tissue	3.61E-01	3.27E-01	9.52E-03	2.46E-01	0.00E+00	2.55E-01	4.71E-03	2.22E-01	0.00E+00	2.27E-01
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Crab Tissue	1.29E-03	1.29E-03	3.33E-03	8.76E-04	1.08E-05	4.22E-03	1.87E-03	8.76E-04	4.66E-06	2.75E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Crab Tissue	4.67E-02	4.67E-02	6.80E-01	3.17E-02	2.66E-04	7.12E-01	2.90E-01	3.17E-02	2.04E-04	3.22E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Crab Tissue	0.00E+00	0.00E+00	5.78E-01	0.00E+00	2.32E-04	5.78E-01	3.95E-01	0.00E+00	8.92E-05	3.95E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Crab Tissue	4.59E+01	4.59E+01	9.28E+00	3.12E+01	7.02E-03	4.05E+01	3.40E+00	3.12E+01	1.36E-03	3.46E+01

TABLE C.15
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Crab Tissue	--	--	1.12E-02	0.00E+00	1.66E-05	1.12E-02	4.51E-03	0.00E+00	5.62E-06	4.52E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Crab Tissue	2.80E-03	2.80E-03	2.21E-02	1.90E-03	2.91E-05	2.40E-02	7.68E-03	1.90E-03	7.28E-06	9.59E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Crab Tissue	1.19E-02	1.19E-02	2.01E-02	8.06E-03	7.50E-03	3.56E-02	1.14E-02	8.06E-03	3.51E-03	2.30E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Crab Tissue	6.69E-03	6.69E-03	1.39E-01	4.55E-03	1.99E-05	1.44E-01	2.03E-02	4.55E-03	5.78E-06	2.48E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Crab Tissue	1.01E-02	1.01E-02	7.14E-02	6.88E-03	1.49E-04	7.84E-02	3.03E-02	6.88E-03	1.14E-05	3.72E-02
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Crab Tissue	--	--	2.07E-01	0.00E+00	7.22E-04	2.08E-01	4.64E-02	0.00E+00	8.13E-05	4.65E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Crab Tissue	4.85E-03	4.85E-03	1.90E-01	3.30E-03	5.64E-04	1.94E-01	4.26E-02	3.30E-03	6.30E-05	4.60E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Crab Tissue	3.15E-02	2.77E-02	1.80E-01	2.14E-02	6.64E-04	2.02E-01	4.30E-02	1.88E-02	8.17E-05	6.20E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Crab Tissue	--	--	6.80E-02	0.00E+00	7.97E-04	6.88E-02	2.42E-02	0.00E+00	9.40E-05	2.43E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Crab Tissue	3.92E-03	3.92E-03	6.12E-02	2.67E-03	7.64E-04	6.46E-02	1.55E-02	2.67E-03	8.47E-05	1.82E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Crab Tissue	8.95E-03	8.95E-03	2.14E-01	6.08E-03	7.97E-04	2.21E-01	4.31E-02	6.08E-03	9.01E-05	4.93E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Crab Tissue	--	--	2.14E-02	0.00E+00	9.13E-04	2.23E-02	8.35E-03	0.00E+00	1.01E-04	8.46E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Crab Tissue	8.69E-02	7.79E-02	4.76E-01	5.91E-02	3.90E-04	5.36E-01	1.03E-01	5.30E-02	3.59E-05	1.56E-01
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	--	Crab Tissue	1.75E-03	1.75E-03	1.53E-02	1.19E-03	1.25E-05	1.65E-02	9.88E-03	1.19E-03	5.04E-06	1.11E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Crab Tissue	--	--	8.50E-02	0.00E+00	8.22E-04	8.58E-02	2.37E-02	0.00E+00	9.59E-05	2.38E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Crab Tissue	1.60E-02	1.60E-02	2.45E+01	1.09E-02	5.56E-04	2.45E+01	7.31E+00	1.09E-02	1.05E-04	7.32E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Crab Tissue	1.60E-02	1.60E-02	6.80E-02	1.09E-02	9.96E-05	7.90E-02	4.98E-02	1.09E-02	1.19E-05	6.07E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Crab Tissue	4.74E-02	4.13E-02	2.01E-01	3.22E-02	3.90E-04	2.33E-01	5.33E-02	2.81E-02	3.78E-05	8.14E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.23E+00	6.57E-02	6.43E-03	1.30E+00	3.00E-01	5.90E-02	7.30E-04	3.60E-01
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.53E+01	1.03E-01	8.78E-03	2.54E+01	7.54E+00	9.73E-02	3.70E-03	7.64E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Crab Tissue	1.44E-01	1.37E-01	1.57E-03	9.82E-02	0.00E+00	9.97E-02	6.12E-04	9.31E-02	0.00E+00	9.37E-02
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Crab Tissue	2.10E-01	1.99E-01	1.66E-03	1.42E-01	0.00E+00	1.44E-01	9.01E-04	1.35E-01	0.00E+00	1.36E-01
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	6.46E-05	1.56E-02	0.00E+00	1.57E-02	6.46E-05	1.56E-02	0.00E+00	1.57E-02
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	2.69E-04	5.37E-02	5.98E-03	6.00E-02	2.69E-04	5.37E-02	1.04E-03	5.50E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	1.67E-05	3.33E-03	3.32E-03	6.67E-03	1.67E-05	3.33E-03	2.15E-04	3.56E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	1.94E-04	3.88E-02	1.25E-03	4.02E-02	1.94E-04	3.88E-02	2.31E-04	3.92E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.16
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	1.46E-06	2.46E-07	0.00E+00	1.71E-06	9.00E-07	1.51E-07	0.00E+00	1.05E-06
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	3.23E-07	1.74E-07	0.00E+00	4.97E-07	1.73E-07	9.32E-08	0.00E+00	2.66E-07
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	7.14E-08	5.05E-08	0.00E+00	1.22E-07	7.14E-08	5.05E-08	0.00E+00	1.22E-07
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	1.60E-08	3.66E-08	0.00E+00	5.25E-08	1.60E-08	3.66E-08	0.00E+00	5.25E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	1.36E-07	1.13E-06	0.00E+00	1.27E-06	1.36E-07	1.13E-06	0.00E+00	1.27E-06
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	1.02E-07	1.07E-06	0.00E+00	1.17E-06	1.02E-07	1.07E-06	0.00E+00	1.17E-06
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	3.74E-08	3.12E-07	0.00E+00	3.50E-07	3.74E-08	3.12E-07	0.00E+00	3.50E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	6.80E-08	6.64E-08	0.00E+00	1.34E-07	6.80E-08	6.64E-08	0.00E+00	1.34E-07
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	1.19E-08	2.28E-07	0.00E+00	2.40E-07	1.19E-08	2.28E-07	0.00E+00	2.40E-07
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	1.33E-08	4.94E-07	0.00E+00	5.07E-07	1.33E-08	4.94E-07	0.00E+00	5.07E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	6.46E-08	3.48E-08	0.00E+00	9.94E-08	6.46E-08	3.48E-08	0.00E+00	9.94E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	1.84E-08	1.53E-07	0.00E+00	1.72E-07	1.84E-08	1.53E-07	0.00E+00	1.72E-07
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	3.74E-08	1.37E-06	0.00E+00	1.41E-06	3.74E-08	1.37E-06	0.00E+00	1.41E-06
2,3,7,8-TCDD	--	--	--	--	--	2.35E-01	SedBAF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	4.76E-08	1.74E-06	0.00E+00	1.79E-06	2.59E-08	9.47E-07	0.00E+00	9.73E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	3.74E-05	3.15E-06	0.00E+00	4.05E-05	3.60E-05	3.03E-06	0.00E+00	3.91E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	2.92E-07	6.49E-07	0.00E+00	9.42E-07	2.45E-07	5.45E-07	0.00E+00	7.90E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	1.00E-07	1.39E-06	0.00E+00	1.49E-06	9.03E-08	1.31E-06	0.00E+00	1.40E-06
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	1.00E-07	1.39E-06	0.00E+00	1.49E-06	9.03E-08	1.31E-06	0.00E+00	1.40E-06
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	--	Crab Tissue	4.18E+00	3.85E+00	6.94E+01	2.84E+00	8.80E-03	7.22E+01	6.94E+01	2.62E+00	7.13E-03	7.20E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	--	Crab Tissue	4.93E-02	4.01E-02	5.78E-03	3.35E-02	2.49E-05	3.94E-02	5.78E-03	2.73E-02	2.10E-05	3.31E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	--	Crab Tissue	1.26E+00	1.26E+00	5.51E-02	8.55E-01	5.31E-04	9.11E-01	3.64E-02	8.59E-01	3.89E-04	8.96E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	--	Crab Tissue	--	--	5.78E-03	0.00E+00	3.15E-06	5.78E-03	5.78E-03	0.00E+00	3.15E-06	5.78E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	--	Crab Tissue	2.21E-01	1.85E-01	5.44E-03	1.50E-01	0.00E+00	1.56E-01	4.58E-03	1.26E-01	0.00E+00	1.30E-01
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	--	Crab Tissue	1.25E-01	1.22E-01	7.65E-01	8.50E-02	1.18E-03	8.51E-01	6.95E-01	8.29E-02	1.04E-03	7.79E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	--	Crab Tissue	1.41E-01	1.23E-01	6.73E-02	9.61E-02	5.64E-05	1.63E-01	6.73E-02	8.36E-02	4.01E-05	1.51E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	--	Crab Tissue	1.62E+01	1.44E+01	3.57E-01	1.10E+01	2.16E-04	1.14E+01	3.11E-01	9.78E+00	1.95E-04	1.01E+01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	--	Crab Tissue	2.13E+01	2.11E+01	1.49E+02	1.45E+01	2.04E-02	1.63E+02	9.32E+01	1.44E+01	1.28E-02	1.08E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	--	Crab Tissue	4.39E-02	4.30E-02	4.11E-01	2.98E-02	3.82E-05	4.41E-01	3.59E-01	2.92E-02	2.92E-05	3.89E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	--	Crab Tissue	6.07E+00	5.38E+00	4.28E+00	4.13E+00	7.09E-03	8.42E+00	4.28E+00	3.66E+00	6.76E-03	7.95E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	--	Crab Tissue	2.66E-02	2.36E-02	1.33E-03	1.81E-02	3.24E-06	1.94E-02	7.72E-04	1.61E-02	3.24E-06	1.69E-02
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	--	Crab Tissue	2.29E-01	2.12E-01	1.27E-01	1.56E-01	5.48E-04	2.84E-01	8.34E-02	1.44E-01	4.70E-04	2.28E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	--	Crab Tissue	1.13E+00	1.10E+00	8.16E-03	7.69E-01	1.42E-03	7.78E-01	8.16E-03	7.51E-01	1.04E-03	7.60E-01
SILVER	--	9.40E-01	8.58E-01	--	--	--	Crab Tissue	3.69E-01	3.15E-01	3.20E-03	2.51E-01	0.00E+00	2.54E-01	2.92E-03	2.14E-01	0.00E+00	2.17E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	--	Crab Tissue	8.52E-03	8.52E-03	9.52E-04	5.79E-03	8.30E-06	6.75E-03	9.52E-04	5.79E-03	7.56E-06	6.75E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	--	Crab Tissue	2.72E-01	2.53E-01	1.31E-01	1.85E-01	3.07E-04	3.16E-01	1.31E-01	1.72E-01	3.07E-04	3.03E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	--	Crab Tissue	0.00E+00	0.00E+00	3.21E-01	0.00E+00	1.74E-04	3.21E-01	3.21E-01	0.00E+00	1.26E-04	3.21E-01
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	--	Crab Tissue	4.76E+01	4.69E+01	1.46E+00	3.24E+01	7.47E-04	3.38E+01	1.28E+00	3.19E+01	5.51E-04	3.32E+01
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	--	Crab Tissue	5.23E-04	5.23E-04	1.12E-03	3.55E-04	5.56E-06	1.48E-03	1.12E-03	3.55E-04	5.56E-06	1.48E-03
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	--	Crab Tissue	--	--	2.14E-03	0.00E+00	1.25E-05	2.15E-03	1.95E-03	0.00E+00	1.02E-05	1.96E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	--	Crab Tissue	1.46E-03	1.46E-03	1.50E-03	9.90E-04	8.80E-03	1.13E-02	1.50E-03	9.90E-04	7.13E-03	9.61E-03
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	--	Crab Tissue	--	--	1.29E-03	0.00E+00	0.00E+00	1.29E-03	1.29E-03	0.00E+00	0.00E+00	1.29E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	--	Crab Tissue	--	--	2.21E-03	0.00E+00	1.99E-06	2.21E-03	2.01E-03	0.00E+00	1.99E-06	2.01E-03
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	--	Crab Tissue	--	--	4.08E-03	0.00E+00	1.16E-05	4.09E-03	4.08E-03	0.00E+00	1.16E-05	4.09E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	--	Crab Tissue	--	--	3.74E-03	0.00E+00	4.23E-06	3.74E-03	3.74E-03	0.00E+00	4.23E-06	3.74E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	--	Crab Tissue	--	--	6.46E-03	0.00E+00	4.07E-06	6.46E-03	6.46E-03	0.00E+00	4.07E-06	6.46E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	--	Crab Tissue	4.15E-03	4.15E-03	2.82E-03	2.82E-03	6.14E-06	5.65E-03	2.82E-03	2.82E-03	6.14E-06	5.65E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	--	Crab Tissue	--	--	9.18E-05	0.00E+00	5.73E-06	9.75E-05	9.18E-05	0.00E+00	5.73E-06	9.75E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	--	Crab Tissue	--	--	3.40E-03	0.00E+00	9.13E-06	3.41E-03	3.40E-03	0.00E+00	9.13E-06	3.41E-03

TABLE C.16
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	8.84E-04	0.00E+00	6.06E-06	8.90E-04	5.07E-04	0.00E+00	6.06E-06	5.13E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	--	Crab Tissue	--	--	7.48E-03	0.00E+00	4.65E-05	7.53E-03	7.48E-03	0.00E+00	4.05E-05	7.52E-03
FLUORENE	Low	6.30E-01	3.22E-01	--	--	--	Crab Tissue	--	--	2.14E-03	0.00E+00	0.00E+00	2.14E-03	1.09E-03	0.00E+00	0.00E+00	1.09E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	2.96E-03	0.00E+00	6.06E-06	2.96E-03	2.96E-03	0.00E+00	6.06E-06	2.96E-03
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	--	Crab Tissue	8.96E-04	8.96E-04	2.82E-02	6.09E-04	2.99E-05	2.89E-02	2.82E-02	6.09E-04	1.44E-05	2.88E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	--	Crab Tissue	4.55E-03	4.55E-03	6.80E-03	3.10E-03	1.08E-05	9.91E-03	6.80E-03	3.10E-03	9.46E-06	9.91E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	--	Crab Tissue	--	--	4.76E-03	0.00E+00	2.57E-05	4.79E-03	4.76E-03	0.00E+00	2.57E-05	4.79E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	NA[B]	NA[B]	NA[B]	NA[B]	2.92E-02	2.82E-03	7.88E-05	3.21E-02	2.88E-02	2.82E-03	7.88E-05	3.17E-02
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	NA[B]	NA[B]	NA[B]	NA[B]	2.92E-02	2.82E-03	7.88E-05	3.21E-02	2.88E-02	2.82E-03	7.88E-05	3.17E-02
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	NA[B]	NA[B]	NA[B]	NA[B]	5.29E-02	5.05E-03	8.91E-03	6.69E-02	5.15E-02	5.05E-03	7.21E-03	6.37E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	NA[B]	NA[B]	NA[B]	NA[B]	5.29E-02	5.05E-03	8.91E-03	6.69E-02	5.15E-02	5.05E-03	7.21E-03	6.37E-02
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	--	Crab Tissue	2.22E-01	2.08E-01	1.48E-04	1.51E-01	0.00E+00	1.51E-01	1.34E-04	1.41E-01	0.00E+00	1.42E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	--	Crab Tissue	2.84E-01	2.72E-01	1.98E-04	1.93E-01	0.00E+00	1.93E-01	1.81E-04	1.85E-01	0.00E+00	1.85E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.17
WILDLIFE EXPOSURE MODELING OF DOSES FROM SURFACE WATER TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg wet wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Fish Tissue	3.22E+01	2.95E+01	8.53E+01	2.19E+01	7.50E-03	1.07E+02	7.54E+01	2.00E+01	3.51E-03	9.54E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Fish Tissue	8.30E-02	5.96E-02	1.12E-02	5.64E-02	2.66E-05	6.77E-02	4.83E-03	4.05E-02	1.73E-05	4.54E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Fish Tissue	7.00E-01	6.66E-01	2.45E-01	4.76E-01	6.31E-04	7.21E-01	9.40E-02	4.53E-01	3.64E-04	5.47E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Fish Tissue	--	--	7.48E-03	0.00E+00	3.90E-06	7.48E-03	5.64E-03	0.00E+00	3.90E-06	5.65E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Fish Tissue	3.60E-01	3.01E-01	1.71E+00	2.45E-01	4.07E-04	1.96E+00	8.03E-01	2.05E-01	3.07E-04	1.01E+00
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Fish Tissue	1.10E-01	9.89E-02	1.80E-01	7.48E-02	4.32E-05	2.55E-01	9.98E-02	6.73E-02	3.27E-05	1.67E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Fish Tissue	3.41E+01	3.05E+01	2.02E+00	2.32E+01	2.41E-04	2.52E+01	5.85E-01	2.07E+01	1.94E-04	2.13E+01
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Fish Tissue	1.42E+02	1.32E+02	4.08E+02	9.66E+01	1.76E-02	5.05E+02	2.60E+02	8.95E+01	8.61E-03	3.49E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Fish Tissue	7.80E-01	7.74E-01	4.35E+00	5.30E-01	4.65E-05	4.88E+00	1.19E+00	5.26E-01	1.60E-05	1.72E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Fish Tissue	1.47E+01	1.42E+01	5.41E+00	1.00E+01	1.64E-02	1.54E+01	4.32E+00	9.68E+00	5.82E-03	1.40E+01
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Fish Tissue	3.40E-02	3.40E-02	5.78E-03	2.31E-02	5.23E-06	2.89E-02	2.33E-03	2.31E-02	4.76E-06	2.55E-02
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Fish Tissue	1.50E-01	1.36E-01	1.92E-01	1.02E-01	6.56E-04	2.94E-01	1.45E-01	9.26E-02	5.28E-04	2.38E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Fish Tissue	1.80E+00	1.70E+00	4.18E-02	1.22E+00	2.03E-03	1.27E+00	1.57E-02	1.16E+00	1.12E-03	1.18E+00
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Fish Tissue	9.50E-03	9.50E-03	3.33E-03	6.46E-03	1.08E-05	9.80E-03	1.87E-03	6.46E-03	4.66E-06	8.33E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Fish Tissue	2.80E-01	2.73E-01	6.80E-01	1.90E-01	2.66E-04	8.71E-01	2.90E-01	1.85E-01	2.04E-04	4.75E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Fish Tissue	0.00E+00	0.00E+00	5.78E-01	0.00E+00	2.32E-04	5.78E-01	3.95E-01	0.00E+00	8.92E-05	3.95E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Fish Tissue	3.21E+01	3.11E+01	9.28E+00	2.18E+01	7.02E-03	3.11E+01	3.40E+00	2.12E+01	1.36E-03	2.46E+01
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Fish Tissue	--	--	1.12E-02	0.00E+00	1.66E-05	1.12E-02	4.51E-03	0.00E+00	5.62E-06	4.52E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Fish Tissue	5.00E-03	5.00E-03	2.21E-02	3.40E-03	2.91E-05	2.55E-02	7.68E-03	3.40E-03	7.28E-06	1.11E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Fish Tissue	1.10E-02	9.68E-03	2.01E-02	7.48E-03	7.50E-03	3.50E-02	1.14E-02	6.58E-03	3.51E-03	2.15E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Fish Tissue	9.00E-03	8.80E-03	1.39E-01	6.12E-03	1.99E-05	1.46E-01	2.03E-02	5.98E-03	5.78E-06	2.63E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Fish Tissue	--	--	7.14E-02	0.00E+00	1.49E-04	7.15E-02	3.03E-02	0.00E+00	1.14E-05	3.04E-02
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Fish Tissue	--	--	2.07E-01	0.00E+00	7.22E-04	2.08E-01	4.64E-02	0.00E+00	8.13E-05	4.65E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Fish Tissue	--	--	1.90E-01	0.00E+00	5.64E-04	1.91E-01	4.26E-02	0.00E+00	6.30E-05	4.27E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Fish Tissue	--	--	1.80E-01	0.00E+00	6.64E-04	1.81E-01	4.30E-02	0.00E+00	8.17E-05	4.31E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Fish Tissue	8.40E-04	8.40E-04	6.80E-02	5.71E-04	7.97E-04	6.94E-02	2.42E-02	5.71E-04	9.40E-05	2.48E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Fish Tissue	--	--	6.12E-02	0.00E+00	7.64E-04	6.20E-02	1.55E-02	0.00E+00	8.47E-05	1.55E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Fish Tissue	--	--	2.14E-01	0.00E+00	7.97E-04	2.15E-01	4.31E-02	0.00E+00	9.01E-05	4.32E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Fish Tissue	--	--	2.14E-02	0.00E+00	9.13E-04	2.23E-02	8.35E-03	0.00E+00	1.01E-04	8.46E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Fish Tissue	5.90E-02	5.10E-02	4.76E-01	4.01E-02	3.90E-04	5.17E-01	1.03E-01	3.47E-02	3.59E-05	1.37E-01
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Fish Tissue	3.20E-03	3.20E-03	8.50E-02	2.18E-03	8.22E-04	8.80E-02	2.37E-02	2.18E-03	9.59E-05	2.60E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Fish Tissue	1.90E-02	1.82E-02	2.45E+01	1.29E-02	5.56E-04	2.45E+01	7.31E+00	1.24E-02	1.05E-04	7.32E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Fish Tissue	1.00E-02	9.69E-03	6.80E-02	6.80E-03	9.96E-05	7.49E-02	4.98E-02	6.59E-03	1.19E-05	5.64E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Fish Tissue	5.40E-03	5.40E-03	2.01E-01	3.67E-03	3.90E-04	2.05E-01	5.33E-02	3.67E-03	3.78E-05	5.70E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.23E+00	6.42E-03	6.43E-03	1.24E+00	3.00E-01	6.42E-03	7.30E-04	3.07E-01
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.53E+01	7.68E-02	8.76E-03	2.54E+01	7.53E+00	6.96E-02	3.70E-03	7.61E+00

TABLE C.17
WILDLIFE EXPOSURE MODELING OF DOSES FROM SURFACE WATER TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg wet wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Fish Tissue	5.37E-01	5.20E-01	1.57E-03	3.65E-01	0.00E+00	3.67E-01	6.12E-04	3.54E-01	0.00E+00	3.54E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Fish Tissue	5.57E-01	5.40E-01	1.66E-03	3.79E-01	0.00E+00	3.80E-01	9.01E-04	3.67E-01	0.00E+00	3.68E-01
VOLATILES																	
1,2-DICHLOROBENZENE	--	--	--	2.90E-03	2.90E-03	8.51E+01	SWBAF	2.47E-01	2.47E-01	0.00E+00	1.68E-01	2.41E-04	1.68E-01	0.00E+00	1.68E-01	2.41E-04	1.68E-01
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.18E+01	SWBAF	8.50E-01	1.47E-01	2.69E-04	5.78E-01	5.98E-03	5.84E-01	2.69E-04	1.00E-01	1.04E-03	1.01E-01
CHLOROFORM	--	--	--	1.00E-03	1.00E-03	9.26E+00	SWBAF	9.26E-03	9.26E-03	0.00E+00	6.30E-03	8.30E-05	6.38E-03	0.00E+00	6.30E-03	8.30E-05	6.38E-03
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	5.56E+01	SWBAF	2.22E+00	1.44E-01	1.67E-05	1.51E+00	3.32E-03	1.52E+00	1.67E-05	9.80E-02	2.15E-04	9.83E-02
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	2.94E+01	SWBAF	4.41E-01	8.20E-02	1.94E-04	3.00E-01	1.25E-03	3.01E-01	1.94E-04	5.57E-02	2.31E-04	5.62E-02
TOTAL XYLENES	--	--	--	6.50E-03	4.44E-03	5.32E+01	SWBAF	3.46E-01	2.36E-01	0.00E+00	2.35E-01	5.40E-04	2.36E-01	0.00E+00	1.61E-01	3.69E-04	1.61E-01

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.18
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS MAMMALS (RACCOON) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.40E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.80E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.30E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Fish) Uptake			Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	Fish Tissue	8.36E+01	6.93E+01	6.94E+01	5.68E+01	8.80E-03	1.26E+02	6.94E+01	4.71E+01	7.13E-03	1.17E+02
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	Fish Tissue	6.90E-02	5.27E-02	5.78E-03	4.69E-02	2.49E-05	5.27E-02	5.78E-03	3.58E-02	2.10E-05	4.16E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	Fish Tissue	8.10E-01	8.02E-01	5.51E-02	5.51E-01	5.31E-04	6.06E-01	3.64E-02	5.45E-01	3.89E-04	5.82E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	Fish Tissue	--	--	5.78E-03	0.00E+00	3.15E-06	5.78E-03	5.78E-03	0.00E+00	3.15E-06	5.78E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	Fish Tissue	6.80E-01	6.80E-01	7.65E-01	4.62E-01	1.18E-03	1.23E+00	6.95E-01	4.62E-01	1.04E-03	1.16E+00
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	Fish Tissue	1.10E-01	1.07E-01	6.73E-02	7.48E-02	5.64E-05	1.42E-01	6.73E-02	7.25E-02	4.01E-05	1.40E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	Fish Tissue	2.57E+01	2.30E+01	3.57E-01	1.75E+01	2.16E-04	1.78E+01	3.11E-01	1.57E+01	1.95E-04	1.60E+01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	Fish Tissue	1.26E+02	1.08E+02	1.49E+02	8.57E+01	2.04E-02	2.35E+02	9.32E+01	7.35E+01	1.28E-02	1.67E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	Fish Tissue	4.10E-01	3.82E-01	4.11E-01	2.79E-01	3.82E-05	6.90E-01	3.59E-01	2.60E-01	2.92E-05	6.19E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	Fish Tissue	2.38E+01	2.04E+01	4.28E+00	1.62E+01	7.09E-03	2.05E+01	4.28E+00	1.39E+01	6.76E-03	1.82E+01
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	Fish Tissue	4.50E-02	3.82E-02	1.33E-03	3.06E-02	3.24E-06	3.19E-02	7.72E-04	2.60E-02	3.24E-06	2.67E-02
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	Fish Tissue	2.40E-01	2.25E-01	1.27E-01	1.63E-01	5.48E-04	2.91E-01	8.34E-02	1.53E-01	4.70E-04	2.37E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	Fish Tissue	1.40E+00	1.35E+00	8.16E-03	9.52E-01	1.42E-03	9.62E-01	8.16E-03	9.15E-01	1.04E-03	9.24E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	Fish Tissue	--	--	9.52E-04	0.00E+00	8.30E-06	9.60E-04	9.52E-04	0.00E+00	7.56E-06	9.60E-04
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	Fish Tissue	2.90E-01	2.86E-01	1.31E-01	1.97E-01	3.07E-04	3.28E-01	1.31E-01	1.95E-01	3.07E-04	3.26E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	Fish Tissue	0.00E+00	0.00E+00	3.21E-01	0.00E+00	1.74E-04	3.21E-01	3.21E-01	0.00E+00	1.26E-04	3.21E-01
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	Fish Tissue	2.43E+01	2.41E+01	1.46E+00	1.65E+01	7.47E-04	1.80E+01	1.28E+00	1.64E+01	5.51E-04	1.77E+01
PAHS																
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	Fish Tissue	--	--	1.12E-03	0.00E+00	5.56E-06	1.13E-03	1.12E-03	0.00E+00	5.56E-06	1.13E-03
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	Fish Tissue	4.40E-03	4.40E-03	2.14E-03	2.99E-03	1.25E-05	5.15E-03	1.95E-03	2.99E-03	1.02E-05	4.95E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	Fish Tissue	5.10E-03	5.10E-03	1.50E-03	3.47E-03	8.80E-03	1.38E-02	1.50E-03	3.47E-03	7.13E-03	1.21E-02
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	Fish Tissue	--	--	2.21E-03	0.00E+00	1.99E-06	2.21E-03	2.01E-03	0.00E+00	1.99E-06	2.01E-03
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	Fish Tissue	--	--	4.08E-03	0.00E+00	1.16E-05	4.09E-03	4.08E-03	0.00E+00	1.16E-05	4.09E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	Fish Tissue	--	--	3.74E-03	0.00E+00	4.23E-06	3.74E-03	3.74E-03	0.00E+00	4.23E-06	3.74E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	Fish Tissue	--	--	6.46E-03	0.00E+00	4.07E-06	6.46E-03	6.46E-03	0.00E+00	4.07E-06	6.46E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	Fish Tissue	--	--	2.82E-03	0.00E+00	6.14E-06	2.83E-03	2.82E-03	0.00E+00	6.14E-06	2.83E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	Fish Tissue	--	--	9.18E-05	0.00E+00	5.73E-06	9.75E-05	9.18E-05	0.00E+00	5.73E-06	9.75E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	Fish Tissue	--	--	3.40E-03	0.00E+00	9.13E-06	3.41E-03	3.40E-03	0.00E+00	9.13E-06	3.41E-03
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	8.84E-04	0.00E+00	6.06E-06	8.90E-04	5.07E-04	0.00E+00	6.06E-06	5.13E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	Fish Tissue	--	--	7.48E-03	0.00E+00	4.65E-05	7.53E-03	7.48E-03	0.00E+00	4.05E-05	7.52E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	2.96E-03	0.00E+00	6.06E-06	2.96E-03	2.96E-03	0.00E+00	6.06E-06	2.96E-03
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	Fish Tissue	--	--	2.82E-02	0.00E+00	2.99E-05	2.82E-02	2.82E-02	0.00E+00	1.44E-05	2.82E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	Fish Tissue	1.00E-02	9.68E-03	6.80E-03	6.80E-03	1.08E-05	1.36E-02	6.80E-03	6.58E-03	9.46E-06	1.34E-02
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	Fish Tissue	--	--	4.76E-03	0.00E+00	2.57E-05	4.79E-03	4.76E-03	0.00E+00	2.57E-05	4.79E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	Fish Tissue	NA[B]	NA[B]	2.92E-02	0.00E+00	7.88E-05	2.93E-02	2.88E-02	0.00E+00	7.88E-05	2.89E-02
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	Fish Tissue	NA[B]	NA[B]	2.92E-02	0.00E+00	7.88E-05	2.93E-02	2.88E-02	0.00E+00	7.88E-05	2.89E-02
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	Fish Tissue	NA[B]	NA[B]	4.95E-02	1.33E-02	8.91E-03	7.16E-02	4.91E-02	1.30E-02	7.21E-03	6.93E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	Fish Tissue	NA[B]	NA[B]	4.95E-02	1.33E-02	8.91E-03	7.16E-02	4.91E-02	1.30E-02	7.21E-03	6.93E-02
PCBS																
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	Fish Tissue	4.54E-01	4.54E-01	1.48E-04	3.09E-01	0.00E+00	3.09E-01	1.34E-04	3.09E-01	0.00E+00	3.09E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	Fish Tissue	4.74E-01	4.74E-01	1.98E-04	3.22E-01	0.00E+00	3.23E-01	1.81E-04	3.22E-01	0.00E+00	3.23E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.19
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	7.36E-06	1.24E-06	0.00E+00	8.60E-06	1.37E-06	2.30E-07	0.00E+00	1.60E-06
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	6.72E-07	3.62E-07	0.00E+00	1.03E-06	2.05E-07	1.11E-07	0.00E+00	3.16E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	6.40E-08	4.52E-08	0.00E+00	1.09E-07	3.14E-08	2.22E-08	0.00E+00	5.36E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	2.56E-08	5.86E-08	0.00E+00	8.42E-08	9.94E-09	2.28E-08	0.00E+00	3.27E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	1.15E-07	9.61E-07	0.00E+00	1.08E-06	4.83E-08	4.03E-07	0.00E+00	4.51E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	2.21E-07	2.31E-06	0.00E+00	2.53E-06	6.89E-08	7.22E-07	0.00E+00	7.91E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	4.16E-08	3.47E-07	0.00E+00	3.89E-07	2.49E-08	2.07E-07	0.00E+00	2.32E-07
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	1.15E-07	1.12E-07	0.00E+00	2.28E-07	3.89E-08	3.79E-08	0.00E+00	7.68E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	4.48E-09	8.59E-08	0.00E+00	9.04E-08	3.28E-09	6.29E-08	0.00E+00	6.62E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	3.52E-08	1.31E-06	0.00E+00	1.35E-06	1.24E-08	4.62E-07	0.00E+00	4.74E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	4.16E-08	2.24E-08	0.00E+00	6.40E-08	2.29E-08	1.24E-08	0.00E+00	3.53E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	3.84E-08	3.20E-07	0.00E+00	3.59E-07	1.86E-08	1.55E-07	0.00E+00	1.74E-07
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	4.48E-08	1.64E-06	0.00E+00	1.69E-06	2.49E-08	9.12E-07	0.00E+00	9.37E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	1.38E-08	6.47E-07	0.00E+00	6.60E-07	5.51E-09	2.59E-07	0.00E+00	2.65E-07
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	9.28E-08	3.39E-06	0.00E+00	3.48E-06	3.72E-08	1.36E-06	0.00E+00	1.40E-06
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	1.06E-04	8.88E-06	0.00E+00	1.14E-04	2.12E-05	1.79E-06	0.00E+00	2.30E-05
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	2.82E-06	6.25E-06	0.00E+00	9.07E-06	8.54E-07	1.90E-06	0.00E+00	2.75E-06
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	2.43E-07	3.23E-06	0.00E+00	3.47E-06	7.38E-08	1.30E-06	0.00E+00	1.37E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	2.69E-01	5.38E+01	0.00E+00	5.40E+01	1.08E-01	2.15E+01	0.00E+00	2.16E+01
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	4.00E-03	Benthic Tissue	1.00E+02	8.87E+01	8.03E+01	6.42E+01	7.32E-03	1.45E+02	7.10E+01	5.68E+01	3.43E-03	1.28E+02
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	3.15E-02	Benthic Tissue	1.04E-01	4.47E-02	1.06E-02	6.64E-02	2.59E-05	7.70E-02	4.54E-03	2.86E-02	1.69E-05	3.31E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	5.41E-02	Benthic Tissue	3.89E+00	1.49E+00	2.30E-01	2.49E+00	6.16E-04	2.72E+00	8.84E-02	9.57E-01	3.55E-04	1.05E+00
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	7.04E-03	0.00E+00	3.81E-06	7.04E-03	5.31E-03	0.00E+00	3.81E-06	5.32E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	7.76E-03	Benthic Tissue	5.97E-02	2.30E-02	2.46E-02	3.82E-02	0.00E+00	6.29E-02	9.49E-03	1.47E-02	0.00E+00	2.42E-02
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	4.68E-03	Benthic Tissue	2.36E+00	1.11E+00	1.61E+00	1.51E+00	3.97E-04	3.12E+00	7.56E-01	7.07E-01	3.00E-04	1.46E+00
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	9.67E-03	Benthic Tissue	5.12E-01	2.84E-01	1.70E-01	3.28E-01	4.21E-05	4.98E-01	9.39E-02	1.82E-01	3.19E-05	2.76E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	7.75E-03	Benthic Tissue	4.61E+00	1.33E+00	1.90E+00	2.95E+00	2.35E-04	4.85E+00	5.50E-01	8.53E-01	1.90E-04	1.40E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	4.63E-03	Benthic Tissue	5.56E+02	3.54E+02	3.84E+02	3.56E+02	1.72E-02	7.40E+02	2.44E+02	2.26E+02	8.40E-03	4.71E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	3.62E-03	Benthic Tissue	4.64E+00	1.27E+00	4.10E+00	2.97E+00	4.54E-05	7.07E+00	1.12E+00	8.13E-01	1.56E-05	1.93E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	5.47E-03	Benthic Tissue	8.69E+00	6.94E+00	5.09E+00	5.56E+00	1.60E-02	1.07E+01	4.06E+00	4.44E+00	5.68E-03	8.51E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	1.43E-02	Benthic Tissue	2.44E-02	9.83E-03	5.44E-03	1.56E-02	5.10E-06	2.10E-02	2.20E-03	6.29E-03	4.64E-06	8.49E-03
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	1.14E-02	Benthic Tissue	6.42E-01	4.86E-01	1.80E-01	4.11E-01	6.40E-04	5.92E-01	1.37E-01	3.11E-01	5.15E-04	4.48E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	5.24E-02	Benthic Tissue	6.45E-01	2.42E-01	3.94E-02	4.13E-01	1.98E-03	4.54E-01	1.48E-02	1.55E-01	1.09E-03	1.71E-01
SILVER	--	2.80E+00	1.39E+00	--	--	2.02E-02	Benthic Tissue	5.66E-02	2.80E-02	8.96E-03	3.63E-02	0.00E+00	4.52E-02	4.43E-03	1.79E-02	0.00E+00	2.24E-02
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	1.39E-02	Benthic Tissue	1.36E-02	7.64E-03	3.14E-03	8.72E-03	1.05E-05	1.19E-02	1.76E-03	4.89E-03	4.55E-06	6.66E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	8.48E-03	Benthic Tissue	1.70E+00	7.23E-01	6.40E-01	1.09E+00	2.59E-04	1.73E+00	2.73E-01	4.63E-01	1.99E-04	7.35E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	5.41E-02	Benthic Tissue	9.19E+00	6.28E+00	5.44E-01	5.88E+00	2.27E-04	6.43E+00	3.72E-01	4.02E+00	8.71E-05	4.39E+00
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	2.45E-02	Benthic Tissue	6.68E+01	2.44E+01	8.74E+00	4.27E+01	6.85E-03	5.15E+01	3.20E+00	1.56E+01	1.33E-03	1.88E+01

TABLE C.19
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Benthos)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	1.69E-01	Benthic Tissue	5.58E-01	2.24E-01	1.06E-02	3.57E-01	1.62E-05	3.68E-01	4.25E-03	1.44E-01	5.48E-06	1.48E-01
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	3.50E-02	Benthic Tissue	2.28E-01	7.91E-02	2.08E-02	1.46E-01	2.84E-05	1.66E-01	7.23E-03	5.06E-02	7.10E-06	5.78E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	8.48E-02	Benthic Tissue	5.00E-01	2.85E-01	1.89E-02	3.20E-01	7.32E-03	3.46E-01	1.08E-02	1.83E-01	3.43E-03	1.97E-01
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	5.02E-02	Benthic Tissue	2.06E+00	3.00E-01	1.31E-01	1.32E+00	1.94E-05	1.45E+00	1.91E-02	1.92E-01	5.64E-06	2.11E-01
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	8.24E-02	Benthic Tissue	1.73E+00	7.35E-01	6.72E-02	1.11E+00	1.46E-04	1.17E+00	2.86E-02	4.70E-01	1.11E-05	4.99E-01
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	1.49E-01	Benthic Tissue	9.12E+00	2.04E+00	1.95E-01	5.84E+00	7.05E-04	6.03E+00	4.37E-02	1.31E+00	7.94E-05	1.35E+00
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	7.31E-02	Benthic Tissue	4.09E+00	9.17E-01	1.79E-01	2.62E+00	5.51E-04	2.80E+00	4.01E-02	5.87E-01	6.15E-05	6.27E-01
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	4.74E-02	Benthic Tissue	2.51E+00	6.00E-01	1.70E-01	1.61E+00	6.48E-04	1.78E+00	4.05E-02	3.84E-01	7.97E-05	4.24E-01
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	2.33E-02	Benthic Tissue	4.65E-01	1.65E-01	6.40E-02	2.98E-01	7.78E-04	3.63E-01	2.27E-02	1.06E-01	9.17E-05	1.29E-01
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	5.76E-02	0.00E+00	7.45E-04	5.83E-02	1.45E-02	0.00E+00	8.27E-05	1.46E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	1.45E-01	Benthic Tissue	9.16E+00	1.84E+00	2.02E-01	5.86E+00	7.78E-04	6.07E+00	4.05E-02	1.18E+00	8.79E-05	1.22E+00
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	1.78E-01	Benthic Tissue	1.12E+00	4.37E-01	2.02E-02	7.17E-01	8.91E-04	7.38E-01	7.86E-03	2.80E-01	9.88E-05	2.87E-01
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	3.10E-01	Benthic Tissue	4.34E+01	9.37E+00	4.48E-01	2.78E+01	3.81E-04	2.82E+01	9.67E-02	5.99E+00	3.50E-05	6.09E+00
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	2.79E-02	Benthic Tissue	1.26E-01	8.12E-02	1.44E-02	8.04E-02	1.22E-05	9.49E-02	9.30E-03	5.19E-02	4.92E-06	6.13E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	5.66E-02	Benthic Tissue	1.41E+00	3.94E-01	8.00E-02	9.05E-01	8.02E-04	9.86E-01	2.23E-02	2.52E-01	9.36E-05	2.75E-01
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	1.75E-02	Benthic Tissue	1.26E+02	3.76E+01	2.30E+01	8.06E+01	5.43E-04	1.04E+02	6.88E+00	2.40E+01	1.03E-04	3.09E+01
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	7.59E-02	Benthic Tissue	1.52E+00	1.11E+00	6.40E-02	9.72E-01	9.72E-05	1.04E+00	4.69E-02	7.12E-01	1.16E-05	7.59E-01
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	3.45E-01	Benthic Tissue	2.04E+01	5.41E+00	1.89E-01	1.30E+01	3.81E-04	1.32E+01	5.01E-02	3.46E+00	3.69E-05	3.51E+00
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.16E+00	3.09E+01	6.28E-03	3.21E+01	2.82E-01	7.56E+00	7.12E-04	7.84E+00
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.38E+01	1.13E+02	8.56E-03	1.36E+02	7.10E+00	3.18E+01	3.61E-03	3.89E+01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	6.35E+00	Benthic Tissue	2.92E+00	1.14E+00	1.47E-03	1.87E+00	0.00E+00	1.87E+00	5.76E-04	7.31E-01	0.00E+00	7.32E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	6.90E+00	Benthic Tissue	3.37E+00	1.83E+00	1.56E-03	2.16E+00	0.00E+00	2.16E+00	8.48E-04	1.17E+00	0.00E+00	1.17E+00
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	6.08E-05	1.47E-02	0.00E+00	1.48E-02	6.08E-05	1.47E-02	0.00E+00	1.48E-02
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	2.53E-04	5.06E-02	5.83E-03	5.66E-02	2.53E-04	5.06E-02	1.01E-03	5.18E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	1.57E-05	3.14E-03	3.24E-03	6.39E-03	1.57E-05	3.14E-03	2.10E-04	3.36E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	1.82E-04	3.65E-02	1.22E-03	3.79E-02	1.82E-04	3.65E-02	2.26E-04	3.69E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.20
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	1.38E-06	2.32E-07	0.00E+00	1.61E-06	8.47E-07	1.43E-07	0.00E+00	9.89E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	3.04E-07	1.64E-07	0.00E+00	4.68E-07	1.63E-07	8.77E-08	0.00E+00	2.51E-07
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	6.72E-08	4.75E-08	0.00E+00	1.15E-07	6.72E-08	4.75E-08	0.00E+00	1.15E-07
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	1.50E-08	3.44E-08	0.00E+00	4.95E-08	1.50E-08	3.44E-08	0.00E+00	4.95E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	1.28E-07	1.07E-06	0.00E+00	1.20E-06	1.28E-07	1.07E-06	0.00E+00	1.20E-06
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	9.60E-08	1.01E-06	0.00E+00	1.10E-06	9.60E-08	1.01E-06	0.00E+00	1.10E-06
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	3.52E-08	2.94E-07	0.00E+00	3.29E-07	3.52E-08	2.94E-07	0.00E+00	3.29E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	6.40E-08	6.25E-08	0.00E+00	1.26E-07	6.40E-08	6.25E-08	0.00E+00	1.26E-07
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	1.12E-08	2.15E-07	0.00E+00	2.26E-07	1.12E-08	2.15E-07	0.00E+00	2.26E-07
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	1.25E-08	4.64E-07	0.00E+00	4.77E-07	1.25E-08	4.64E-07	0.00E+00	4.77E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	6.08E-08	3.27E-08	0.00E+00	9.35E-08	6.08E-08	3.27E-08	0.00E+00	9.35E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	1.73E-08	1.44E-07	0.00E+00	1.61E-07	1.73E-08	1.44E-07	0.00E+00	1.61E-07
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	3.52E-08	1.29E-06	0.00E+00	1.33E-06	3.52E-08	1.29E-06	0.00E+00	1.33E-06
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	4.48E-08	1.64E-06	0.00E+00	1.68E-06	2.44E-08	8.91E-07	0.00E+00	9.15E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	3.52E-05	2.96E-06	0.00E+00	3.82E-05	3.39E-05	2.85E-06	0.00E+00	3.68E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	2.75E-07	6.11E-07	0.00E+00	8.86E-07	2.31E-07	5.13E-07	0.00E+00	7.44E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	9.41E-08	1.30E-06	0.00E+00	1.40E-06	8.50E-08	1.23E-06	0.00E+00	1.31E-06
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	9.41E-08	1.30E-06	0.00E+00	1.40E-06	8.50E-08	1.23E-06	0.00E+00	1.31E-06
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	4.00E-03	Benthic Tissue	8.16E+01	8.16E+01	6.53E+01	5.22E+01	8.59E-03	1.18E+02	6.53E+01	5.22E+01	6.96E-03	1.18E+02
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	3.15E-02	Benthic Tissue	5.35E-02	5.35E-02	5.44E-03	3.42E-02	2.43E-05	3.97E-02	5.44E-03	3.42E-02	2.05E-05	3.97E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	5.41E-02	Benthic Tissue	8.76E-01	5.79E-01	5.18E-02	5.61E-01	5.18E-04	6.13E-01	3.43E-02	3.71E-01	3.80E-04	4.05E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	5.44E-03	0.00E+00	3.08E-06	5.44E-03	5.44E-03	0.00E+00	3.08E-06	5.44E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	7.76E-03	Benthic Tissue	1.24E-02	1.05E-02	5.12E-03	7.94E-03	0.00E+00	1.31E-02	4.31E-03	6.69E-03	0.00E+00	1.10E-02
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	4.68E-03	Benthic Tissue	1.05E+00	9.56E-01	7.20E-01	6.74E-01	1.15E-03	1.39E+00	6.54E-01	6.12E-01	1.02E-03	1.27E+00
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	9.67E-03	Benthic Tissue	1.91E-01	1.91E-01	6.34E-02	1.22E-01	5.51E-05	1.86E-01	6.34E-02	1.22E-01	3.91E-05	1.86E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	7.75E-03	Benthic Tissue	8.14E-01	7.10E-01	3.36E-01	5.21E-01	2.11E-04	8.57E-01	2.93E-01	4.54E-01	1.90E-04	7.48E-01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	4.63E-03	Benthic Tissue	2.03E+02	1.27E+02	1.40E+02	1.30E+02	1.99E-02	2.70E+02	8.77E+01	8.13E+01	1.25E-02	1.69E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	3.62E-03	Benthic Tissue	4.39E-01	3.83E-01	3.87E-01	2.81E-01	3.73E-05	6.68E-01	3.38E-01	2.45E-01	2.85E-05	5.83E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	5.47E-03	Benthic Tissue	6.89E+00	6.89E+00	4.03E+00	4.41E+00	6.92E-03	8.45E+00	4.03E+00	4.41E+00	6.60E-03	8.45E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	1.43E-02	Benthic Tissue	5.59E-03	3.25E-03	1.25E-03	3.58E-03	3.16E-06	4.83E-03	7.26E-04	2.08E-03	3.16E-06	2.81E-03
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	1.14E-02	Benthic Tissue	4.26E-01	2.79E-01	1.20E-01	2.72E-01	5.35E-04	3.93E-01	7.85E-02	1.79E-01	4.58E-04	2.58E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	5.24E-02	Benthic Tissue	1.26E-01	1.26E-01	7.68E-03	8.06E-02	1.39E-03	8.96E-02	7.68E-03	8.06E-02	1.02E-03	8.93E-02
SILVER	--	9.40E-01	8.58E-01	--	--	2.02E-02	Benthic Tissue	1.90E-02	1.74E-02	3.01E-03	1.22E-02	0.00E+00	1.52E-02	2.75E-03	1.11E-02	0.00E+00	1.39E-02
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	1.39E-02	Benthic Tissue	3.89E-03	3.89E-03	8.96E-04	2.49E-03	8.10E-06	3.39E-03	8.96E-04	2.49E-03	7.38E-06	3.39E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	8.48E-03	Benthic Tissue	3.26E-01	3.26E-01	1.23E-01	2.09E-01	3.00E-04	3.32E-01	1.23E-01	2.09E-01	3.00E-04	3.32E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	5.41E-02	Benthic Tissue	5.11E+00	5.11E+00	3.02E-01	3.27E+00	1.70E-04	3.57E+00	3.02E-01	3.27E+00	1.23E-04	3.57E+00
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	2.45E-02	Benthic Tissue	1.05E+01	9.20E+00	1.37E+00	6.72E+00	7.29E-04	8.09E+00	1.20E+00	5.88E+00	5.37E-04	7.09E+00
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	1.69E-01	Benthic Tissue	5.58E-02	5.58E-02	1.06E-03	3.57E-02	5.43E-06	3.68E-02	1.06E-03	3.57E-02	5.43E-06	3.68E-02
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	3.50E-02	Benthic Tissue	2.21E-02	2.01E-02	2.02E-03	1.41E-02	1.22E-05	1.61E-02	1.84E-03	1.29E-02	9.96E-06	1.47E-02
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	8.48E-02	Benthic Tissue	3.73E-02	3.73E-02	1.41E-03	2.39E-02	8.59E-03	3.39E-02	1.41E-03	2.39E-02	6.96E-03	3.22E-02
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	5.02E-02	Benthic Tissue	1.91E-02	1.91E-02	1.22E-03	1.22E-02	0.00E+00	1.34E-02	1.22E-03	1.22E-02	0.00E+00	1.34E-02
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	8.24E-02	Benthic Tissue	5.35E-02	4.88E-02	2.08E-03	3.43E-02	1.94E-06	3.63E-02	1.89E-03	3.12E-02	1.94E-06	3.31E-02
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	1.49E-01	Benthic Tissue	1.79E-01	1.79E-01	3.84E-03	1.15E-01	1.13E-05	1.19E-01	3.84E-03	1.15E-01	1.13E-05	1.19E-01
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	7.31E-02	Benthic Tissue	8.04E-02	8.04E-02	3.52E-03	5.15E-02	4.13E-06	5.50E-02	3.52E-03	5.15E-02	4.13E-06	5.50E-02
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	4.74E-02	Benthic Tissue	9.00E-02	9.00E-02	6.08E-03	5.76E-02	3.97E-06	6.37E-02	6.08E-03	5.76E-02	3.97E-06	6.37E-02
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	2.33E-02	Benthic Tissue	1.93E-02	1.93E-02	2.66E-03	1.24E-02	5.99E-06	1.50E-02	2.66E-03	1.24E-02	5.99E-06	1.50E-02
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	0.00E+00	Benthic Tissue	0.00E+00	0.00E+00	8.64E-05	0.00E+00	5.59E-06	9.20E-05	8.64E-05	0.00E+00	5.59E-06	9.20E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	1.45E-01	Benthic Tissue	1.45E-01	1.45E-01	3.20E-03	9.31E-02	8.91E-06	9.63E-02	3.20E-03	9.31E-02	8.91E-06	9.63E-02
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	1.78E-01	Benthic Tissue	4.62E-02	2.65E-02	8.32E-04	2.96E-02	5.91E-06	3.04E-02	4.77E-04	1.70E-02	5.91E-06	1.74E-02
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	3.10E-01	Benthic Tissue	6.82E-01	6.82E-01	7.04E-03	4.36E-01	4.54E-05	4.43E-01	7.04E-03	4.36E-01	3.95E-05	4.43E-01
FLUORENE	Low	6.30E-01	3.22E-01	--	--	2.79E-02	Benthic Tissue	1.76E-02	8.99E-03	2.02E-03	1.13E-02	0.00E+00	1.33E-02	1.03E-03	5.76E-03	0.00E+00	6.79E-03

TABLE C.20
WILDLIFE EXPOSURE MODELING OF DOSES FROM BENTHOS TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Benthos) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	5.66E-02	Benthic Tissue	4.92E-02	4.92E-02	2.78E-03	3.15E-02	5.91E-06	3.43E-02	2.78E-03	3.15E-02	5.91E-06	3.43E-02
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	1.75E-02	Benthic Tissue	1.45E-01	1.45E-01	2.66E-02	9.29E-02	2.92E-05	1.19E-01	2.66E-02	9.29E-02	1.40E-05	1.19E-01
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	7.59E-02	Benthic Tissue	1.52E-01	1.52E-01	6.40E-03	9.72E-02	1.05E-05	1.04E-01	6.40E-03	9.72E-02	9.23E-06	1.04E-01
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	3.45E-01	Benthic Tissue	4.84E-01	4.84E-01	4.48E-03	3.10E-01	2.51E-05	3.14E-01	4.48E-03	3.10E-01	2.51E-05	3.14E-01
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	NA[B]	NA[B]	NA	NA	2.75E-02	7.00E-01	7.69E-05	7.27E-01	2.71E-02	6.87E-01	7.69E-05	7.14E-01
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	NA[B]	NA[B]	NA	NA	2.75E-02	7.00E-01	7.69E-05	7.27E-01	2.71E-02	6.87E-01	7.69E-05	7.14E-01
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	NA[B]	NA[B]	NA	NA	4.98E-02	7.58E-01	8.69E-03	8.16E-01	4.84E-02	7.48E-01	7.04E-03	8.04E-01
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	NA[B]	NA[B]	NA	NA	4.98E-02	7.58E-01	8.69E-03	8.16E-01	4.84E-02	7.48E-01	7.04E-03	8.04E-01
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	6.35E+00	Benthic Tissue	2.75E-01	2.50E-01	1.39E-04	1.76E-01	0.00E+00	1.76E-01	1.26E-04	1.60E-01	0.00E+00	1.60E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	6.90E+00	Benthic Tissue	4.02E-01	3.67E-01	1.86E-04	2.58E-01	0.00E+00	2.58E-01	1.70E-04	2.35E-01	0.00E+00	2.35E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.21
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	2.30E-03	4.28E-04	--	--	8.41E-04	SedBAF	1.93E-06	3.60E-07	7.36E-06	1.24E-06	0.00E+00	8.60E-06	1.37E-06	2.30E-07	0.00E+00	1.60E-06
1,2,3,4,6,7,8-HPCDF	--	2.10E-04	6.42E-05	--	--	2.69E-03	SedBAF	5.65E-07	1.73E-07	6.72E-07	3.62E-07	0.00E+00	1.03E-06	2.05E-07	1.11E-07	0.00E+00	3.16E-07
1,2,3,4,7,8,9-HPCDF	--	2.00E-05	9.82E-06	--	--	3.53E-03	SedBAF	7.07E-08	3.47E-08	6.40E-08	4.52E-08	0.00E+00	1.09E-07	3.14E-08	2.22E-08	0.00E+00	5.36E-08
1,2,3,4,7,8-HXCDD	--	8.00E-06	3.11E-06	--	--	1.14E-02	SedBAF	9.15E-08	3.56E-08	2.56E-08	5.86E-08	0.00E+00	8.42E-08	9.94E-09	2.28E-08	0.00E+00	3.27E-08
1,2,3,4,7,8-HXCDF	--	3.60E-05	1.51E-05	--	--	4.17E-02	SedBAF	1.50E-06	6.29E-07	1.15E-07	9.61E-07	0.00E+00	1.08E-06	4.83E-08	4.03E-07	0.00E+00	4.51E-07
1,2,3,6,7,8-HXCDD	--	6.90E-05	2.15E-05	--	--	5.24E-02	SedBAF	3.61E-06	1.13E-06	2.21E-07	2.31E-06	0.00E+00	2.53E-06	6.89E-08	7.22E-07	0.00E+00	7.91E-07
1,2,3,6,7,8-HXCDF	--	1.30E-05	7.77E-06	--	--	4.17E-02	SedBAF	5.42E-07	3.24E-07	4.16E-08	3.47E-07	0.00E+00	3.89E-07	2.49E-08	2.07E-07	0.00E+00	2.32E-07
1,2,3,7,8,9-HXCDD	--	3.60E-05	1.21E-05	--	--	4.88E-03	SedBAF	1.76E-07	5.92E-08	1.15E-07	1.12E-07	0.00E+00	2.28E-07	3.89E-08	3.79E-08	0.00E+00	7.68E-08
1,2,3,7,8,9-HXCDF	--	1.40E-06	1.03E-06	--	--	9.59E-02	SedBAF	1.34E-07	9.83E-08	4.48E-09	8.59E-08	0.00E+00	9.04E-08	3.28E-09	6.29E-08	0.00E+00	6.62E-08
1,2,3,7,8-PECDD	--	1.10E-05	3.88E-06	--	--	1.86E-01	SedBAF	2.05E-06	7.21E-07	3.52E-08	1.31E-06	0.00E+00	1.35E-06	1.24E-08	4.62E-07	0.00E+00	4.74E-07
1,2,3,7,8-PECDF	--	1.30E-05	7.17E-06	--	--	2.69E-03	SedBAF	3.50E-08	1.93E-08	4.16E-08	2.24E-08	0.00E+00	6.40E-08	2.29E-08	1.24E-08	0.00E+00	3.53E-08
2,3,4,6,7,8-HXCDF	--	1.20E-05	5.82E-06	--	--	4.17E-02	SedBAF	5.01E-07	2.43E-07	3.84E-08	3.20E-07	0.00E+00	3.59E-07	1.86E-08	1.55E-07	0.00E+00	1.74E-07
2,3,4,7,8-PECDF	--	1.40E-05	7.77E-06	--	--	1.84E-01	SedBAF	2.57E-06	1.43E-06	4.48E-08	1.64E-06	0.00E+00	1.69E-06	2.49E-08	9.12E-07	0.00E+00	9.37E-07
2,3,7,8-TCDD	--	4.30E-06	1.72E-06	--	--	2.35E-01	SedBAF	1.01E-06	4.05E-07	1.38E-08	6.47E-07	0.00E+00	6.60E-07	5.51E-09	2.59E-07	0.00E+00	2.65E-07
2,3,7,8-TCDF	--	2.90E-05	1.16E-05	--	--	1.83E-01	SedBAF	5.30E-06	2.12E-06	9.28E-08	3.39E-06	0.00E+00	3.48E-06	3.72E-08	1.36E-06	0.00E+00	1.40E-06
OCDD	--	3.30E-02	6.64E-03	--	--	4.21E-04	SedBAF	1.39E-05	2.79E-06	1.06E-04	8.88E-06	0.00E+00	1.14E-04	2.12E-05	1.79E-06	0.00E+00	2.30E-05
OCDF	--	8.80E-04	2.67E-04	--	--	1.11E-02	SedBAF	9.77E-06	2.96E-06	2.82E-06	6.25E-06	0.00E+00	9.07E-06	8.54E-07	1.90E-06	0.00E+00	2.75E-06
TCDD TEQ (ND = DL)	--	7.77E-05	2.59E-05	--	--	NA[D]	--	NA[D]	NA[D]	2.43E-07	3.23E-06	0.00E+00	3.47E-06	7.38E-08	1.30E-06	0.00E+00	1.37E-06
INORGANICS																	
CYANIDE (TOTAL)	--	8.40E+01	3.37E+01	--	--	1.00E+00	SedBAF	8.40E+01	3.37E+01	2.69E-01	5.38E+01	0.00E+00	5.40E+01	1.08E-01	2.15E+01	0.00E+00	2.16E+01
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Crab Tissue	7.20E+00	6.46E+00	8.03E+01	4.61E+00	7.32E-03	8.49E+01	7.10E+01	4.14E+00	3.43E-03	7.51E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Crab Tissue	3.91E-02	3.39E-02	1.06E-02	2.50E-02	2.59E-05	3.56E-02	4.54E-03	2.17E-02	1.69E-05	2.63E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Crab Tissue	1.24E+00	1.22E+00	2.30E-01	7.95E-01	6.16E-04	1.03E+00	8.84E-02	7.78E-01	3.55E-04	8.67E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Crab Tissue	--	--	7.04E-03	0.00E+00	3.81E-06	7.04E-03	5.31E-03	0.00E+00	3.81E-06	5.32E-03
CADMIUM	--	7.70E+00	2.97E+00	--	--	--	Crab Tissue	1.58E-01	1.51E-01	2.46E-02	1.01E-01	0.00E+00	1.26E-01	9.49E-03	9.65E-02	0.00E+00	1.06E-01
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Crab Tissue	2.12E-01	1.96E-01	1.61E+00	1.35E-01	3.97E-04	1.75E+00	7.56E-01	1.25E-01	3.00E-04	8.81E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Crab Tissue	1.38E-01	1.26E-01	1.70E-01	8.86E-02	4.21E-05	2.58E-01	9.39E-02	8.05E-02	3.19E-05	1.74E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Crab Tissue	1.25E+01	1.07E+01	1.90E+00	7.99E+00	2.35E-04	9.89E+00	5.50E-01	6.87E+00	1.90E-04	7.42E+00
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Crab Tissue	5.01E+01	4.47E+01	3.84E+02	3.21E+01	1.72E-02	4.16E+02	2.44E+02	2.86E+01	8.40E-03	2.73E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Crab Tissue	1.71E-01	1.51E-01	4.10E+00	1.09E-01	4.54E-05	4.21E+00	1.12E+00	9.64E-02	1.56E-05	1.22E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Crab Tissue	1.10E+01	8.76E+00	5.09E+00	7.06E+00	1.60E-02	1.22E+01	4.06E+00	5.61E+00	5.68E-03	9.68E+00
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Crab Tissue	2.10E-02	1.91E-02	5.44E-03	1.34E-02	5.10E-06	1.89E-02	2.20E-03	1.22E-02	4.64E-06	1.44E-02
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Crab Tissue	1.95E-01	1.88E-01	1.80E-01	1.25E-01	6.40E-04	3.06E-01	1.37E-01	1.20E-01	5.15E-04	2.58E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Crab Tissue	1.07E+00	1.00E+00	3.94E-02	6.88E-01	1.98E-03	7.29E-01	1.48E-02	6.41E-01	1.09E-03	6.57E-01
SILVER	--	2.80E+00	1.39E+00	--	--	--	Crab Tissue	3.61E-01	3.27E-01	8.96E-03	2.31E-01	0.00E+00	2.40E-01	4.43E-03	2.09E-01	0.00E+00	2.14E-01
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Crab Tissue	1.29E-03	1.29E-03	3.14E-03	8.24E-04	1.05E-05	3.97E-03	1.76E-03	8.24E-04	4.55E-06	2.59E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Crab Tissue	4.67E-02	4.67E-02	6.40E-01	2.99E-02	2.59E-04	6.70E-01	2.73E-01	2.99E-02	1.99E-04	3.03E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Crab Tissue	0.00E+00	0.00E+00	5.44E-01	0.00E+00	2.27E-04	5.44E-01	3.72E-01	0.00E+00	8.71E-05	3.72E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Crab Tissue	4.59E+01	4.59E+01	8.74E+00	2.94E+01	6.85E-03	3.81E+01	3.20E+00	2.94E+01	1.33E-03	3.26E+01

TABLE C.21
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Crab)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt. sediment to mg/kg wet wt. tissue)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Crab Tissue	--	--	1.06E-02	0.00E+00	1.62E-05	1.06E-02	4.25E-03	0.00E+00	5.48E-06	4.25E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Crab Tissue	2.80E-03	2.80E-03	2.08E-02	1.79E-03	2.84E-05	2.26E-02	7.23E-03	1.79E-03	7.10E-06	9.03E-03
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Crab Tissue	1.19E-02	1.19E-02	1.89E-02	7.59E-03	7.32E-03	3.38E-02	1.08E-02	7.59E-03	3.43E-03	2.18E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Crab Tissue	6.69E-03	6.69E-03	1.31E-01	4.28E-03	1.94E-05	1.35E-01	1.91E-02	4.28E-03	5.64E-06	2.34E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Crab Tissue	1.01E-02	1.01E-02	6.72E-02	6.48E-03	1.46E-04	7.38E-02	2.86E-02	6.48E-03	1.11E-05	3.51E-02
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Crab Tissue	--	--	1.95E-01	0.00E+00	7.05E-04	1.96E-01	4.37E-02	0.00E+00	7.94E-05	4.38E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Crab Tissue	4.85E-03	4.85E-03	1.79E-01	3.11E-03	5.51E-04	1.83E-01	4.01E-02	3.11E-03	6.15E-05	4.33E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Crab Tissue	3.15E-02	2.77E-02	1.70E-01	2.01E-02	6.48E-04	1.90E-01	4.05E-02	1.77E-02	7.97E-05	5.83E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Crab Tissue	--	--	6.40E-02	0.00E+00	7.78E-04	6.48E-02	2.27E-02	0.00E+00	9.17E-05	2.28E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Crab Tissue	3.92E-03	3.92E-03	5.76E-02	2.51E-03	7.45E-04	6.09E-02	1.45E-02	2.51E-03	8.27E-05	1.71E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Crab Tissue	8.95E-03	8.95E-03	2.02E-01	5.73E-03	7.78E-04	2.08E-01	4.05E-02	5.73E-03	8.79E-05	4.64E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Crab Tissue	--	--	2.02E-02	0.00E+00	8.91E-04	2.11E-02	7.86E-03	0.00E+00	9.88E-05	7.96E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Crab Tissue	8.69E-02	7.79E-02	4.48E-01	5.56E-02	3.81E-04	5.04E-01	9.67E-02	4.99E-02	3.50E-05	1.47E-01
FLUORENE	Low	4.50E+00	2.91E+00	1.50E-04	6.07E-05	--	Crab Tissue	1.75E-03	1.75E-03	1.44E-02	1.12E-03	1.22E-05	1.55E-02	9.30E-03	1.12E-03	4.92E-06	1.04E-02
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Crab Tissue	--	--	8.00E-02	0.00E+00	8.02E-04	8.08E-02	2.23E-02	0.00E+00	9.36E-05	2.24E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Crab Tissue	1.60E-02	1.60E-02	2.30E+01	1.02E-02	5.43E-04	2.31E+01	6.88E+00	1.02E-02	1.03E-04	6.89E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Crab Tissue	1.60E-02	1.60E-02	6.40E-02	1.02E-02	9.72E-05	7.43E-02	4.69E-02	1.02E-02	1.16E-05	5.71E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Crab Tissue	4.74E-02	4.13E-02	1.89E-01	3.03E-02	3.81E-04	2.19E-01	5.01E-02	2.64E-02	3.69E-05	7.66E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.16E+00	6.18E-02	6.28E-03	1.22E+00	2.82E-01	5.55E-02	7.12E-04	3.39E-01
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.38E+01	9.74E-02	8.56E-03	2.39E+01	7.10E+00	9.16E-02	3.61E-03	7.19E+00
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Crab Tissue	1.44E-01	1.37E-01	1.47E-03	9.24E-02	0.00E+00	9.39E-02	5.76E-04	8.76E-02	0.00E+00	8.82E-02
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Crab Tissue	2.10E-01	1.99E-01	1.56E-03	1.34E-01	0.00E+00	1.36E-01	8.48E-04	1.27E-01	0.00E+00	1.28E-01
ORGANOTINS																	
TRIBUTYLTIN	--	1.90E-02	1.90E-02	--	--	1.21E+00	SedBAF	2.30E-02	2.30E-02	6.08E-05	1.47E-02	0.00E+00	1.48E-02	6.08E-05	1.47E-02	0.00E+00	1.48E-02
VOLATILES																	
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.00E+00	SedBAF	7.90E-02	7.90E-02	2.53E-04	5.06E-02	5.83E-03	5.66E-02	2.53E-04	5.06E-02	1.01E-03	5.18E-02
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	1.00E+00	SedBAF	4.90E-03	4.90E-03	1.57E-05	3.14E-03	3.24E-03	6.39E-03	1.57E-05	3.14E-03	2.10E-04	3.36E-03
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	1.00E+00	SedBAF	5.70E-02	5.70E-02	1.82E-04	3.65E-02	1.22E-03	3.79E-02	1.82E-04	3.65E-02	2.26E-04	3.69E-02

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for dioxins, inorganics, PCBs, and organotins in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.22
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIOXINS																	
1,2,3,4,6,7,8-HPCDD	--	4.30E-04	2.65E-04	--	--	8.41E-04	SedBAF	3.62E-07	2.23E-07	1.38E-06	2.32E-07	0.00E+00	1.61E-06	8.47E-07	1.43E-07	0.00E+00	9.89E-07
1,2,3,4,6,7,8-HPCDF	--	9.50E-05	5.09E-05	--	--	2.69E-03	SedBAF	2.56E-07	1.37E-07	3.04E-07	1.64E-07	0.00E+00	4.68E-07	1.63E-07	8.77E-08	0.00E+00	2.51E-07
1,2,3,4,7,8,9-HPCDF	--	2.10E-05	2.10E-05	--	--	3.53E-03	SedBAF	7.42E-08	7.42E-08	6.72E-08	4.75E-08	0.00E+00	1.15E-07	6.72E-08	4.75E-08	0.00E+00	1.15E-07
1,2,3,4,7,8-HXCDD	--	4.70E-06	4.70E-06	--	--	1.14E-02	SedBAF	5.38E-08	5.38E-08	1.50E-08	3.44E-08	0.00E+00	4.95E-08	1.50E-08	3.44E-08	0.00E+00	4.95E-08
1,2,3,4,7,8-HXCDF	--	4.00E-05	4.00E-05	--	--	4.17E-02	SedBAF	1.67E-06	1.67E-06	1.28E-07	1.07E-06	0.00E+00	1.20E-06	1.28E-07	1.07E-06	0.00E+00	1.20E-06
1,2,3,6,7,8-HXCDD	--	3.00E-05	3.00E-05	--	--	5.24E-02	SedBAF	1.57E-06	1.57E-06	9.60E-08	1.01E-06	0.00E+00	1.10E-06	9.60E-08	1.01E-06	0.00E+00	1.10E-06
1,2,3,6,7,8-HXCDF	--	1.10E-05	1.10E-05	--	--	4.17E-02	SedBAF	4.59E-07	4.59E-07	3.52E-08	2.94E-07	0.00E+00	3.29E-07	3.52E-08	2.94E-07	0.00E+00	3.29E-07
1,2,3,7,8,9-HXCDD	--	2.00E-05	2.00E-05	--	--	4.88E-03	SedBAF	9.76E-08	9.76E-08	6.40E-08	6.25E-08	0.00E+00	1.26E-07	6.40E-08	6.25E-08	0.00E+00	1.26E-07
1,2,3,7,8,9-HXCDF	--	3.50E-06	3.50E-06	--	--	9.59E-02	SedBAF	3.36E-07	3.36E-07	1.12E-08	2.15E-07	0.00E+00	2.26E-07	1.12E-08	2.15E-07	0.00E+00	2.26E-07
1,2,3,7,8-PECDD	--	3.90E-06	3.90E-06	--	--	1.86E-01	SedBAF	7.26E-07	7.26E-07	1.25E-08	4.64E-07	0.00E+00	4.77E-07	1.25E-08	4.64E-07	0.00E+00	4.77E-07
1,2,3,7,8-PECDF	--	1.90E-05	1.90E-05	--	--	2.69E-03	SedBAF	5.11E-08	5.11E-08	6.08E-08	3.27E-08	0.00E+00	9.35E-08	6.08E-08	3.27E-08	0.00E+00	9.35E-08
2,3,4,6,7,8-HXCDF	--	5.40E-06	5.40E-06	--	--	4.17E-02	SedBAF	2.25E-07	2.25E-07	1.73E-08	1.44E-07	0.00E+00	1.61E-07	1.73E-08	1.44E-07	0.00E+00	1.61E-07
2,3,4,7,8-PECDF	--	1.10E-05	1.10E-05	--	--	1.84E-01	SedBAF	2.02E-06	2.02E-06	3.52E-08	1.29E-06	0.00E+00	1.33E-06	3.52E-08	1.29E-06	0.00E+00	1.33E-06
2,3,7,8-TCDD	--	--	--	--	--	2.35E-01	SedBAF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-TCDF	--	1.40E-05	7.62E-06	--	--	1.83E-01	SedBAF	2.56E-06	1.39E-06	4.48E-08	1.64E-06	0.00E+00	1.68E-06	2.44E-08	8.91E-07	0.00E+00	9.15E-07
OCDD	--	1.10E-02	1.06E-02	--	--	4.21E-04	SedBAF	4.63E-06	4.46E-06	3.52E-05	2.96E-06	0.00E+00	3.82E-05	3.39E-05	2.85E-06	0.00E+00	3.68E-05
OCDF	--	8.60E-05	7.22E-05	--	--	1.11E-02	SedBAF	9.55E-07	8.01E-07	2.75E-07	6.11E-07	0.00E+00	8.86E-07	2.31E-07	5.13E-07	0.00E+00	7.44E-07
TCDD TEQ (ND = 0)	--	9.72E-06	4.31E-05	--	--	NA[D]	--	NA[D]	NA[D]	9.41E-08	1.30E-06	0.00E+00	1.40E-06	8.50E-08	1.23E-06	0.00E+00	1.31E-06
TCDD TEQ (ND = DL)	--	1.15E-05	8.17E-06	--	--	NA[D]	--	NA[D]	NA[D]	9.41E-08	1.30E-06	0.00E+00	1.40E-06	8.50E-08	1.23E-06	0.00E+00	1.31E-06
METALS																	
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	--	Crab Tissue	4.18E+00	3.85E+00	6.53E+01	2.67E+00	8.59E-03	6.80E+01	6.53E+01	2.46E+00	6.96E-03	6.77E+01
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	--	Crab Tissue	4.93E-02	4.01E-02	5.44E-03	3.16E-02	2.43E-05	3.70E-02	5.44E-03	2.57E-02	2.05E-05	3.11E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	--	Crab Tissue	1.26E+00	1.26E+00	5.18E-02	8.05E-01	5.18E-04	8.57E-01	3.43E-02	8.09E-01	3.80E-04	8.43E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	--	Crab Tissue	--	--	5.44E-03	0.00E+00	3.08E-06	5.44E-03	5.44E-03	0.00E+00	3.08E-06	5.44E-03
CADMIUM	--	1.60E+00	1.35E+00	--	--	--	Crab Tissue	2.21E-01	1.85E-01	5.12E-03	1.42E-01	0.00E+00	1.47E-01	4.31E-03	1.18E-01	0.00E+00	1.22E-01
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	--	Crab Tissue	1.25E-01	1.22E-01	7.20E-01	8.00E-02	1.15E-03	8.01E-01	6.54E-01	7.80E-02	1.02E-03	7.33E-01
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	--	Crab Tissue	1.41E-01	1.23E-01	6.34E-02	9.04E-02	5.51E-05	1.54E-01	6.34E-02	7.87E-02	3.91E-05	1.42E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	--	Crab Tissue	1.62E+01	1.44E+01	3.36E-01	1.04E+01	2.11E-04	1.07E+01	2.93E-01	9.20E+00	1.90E-04	9.49E+00
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	--	Crab Tissue	2.13E+01	2.11E+01	1.40E+02	1.37E+01	1.99E-02	1.54E+02	8.77E+01	1.35E+01	1.25E-02	1.01E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	--	Crab Tissue	4.39E-02	4.30E-02	3.87E-01	2.81E-02	3.73E-05	4.15E-01	3.38E-01	2.75E-02	2.85E-05	3.66E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	--	Crab Tissue	6.07E+00	5.38E+00	4.03E+00	3.89E+00	6.92E-03	7.93E+00	4.03E+00	3.45E+00	6.60E-03	7.48E+00
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	--	Crab Tissue	2.66E-02	2.36E-02	1.25E-03	1.70E-02	3.16E-06	1.83E-02	7.26E-04	1.51E-02	3.16E-06	1.59E-02
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	--	Crab Tissue	2.29E-01	2.12E-01	1.20E-01	1.47E-01	5.35E-04	2.67E-01	7.85E-02	1.36E-01	4.58E-04	2.15E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	--	Crab Tissue	1.13E+00	1.10E+00	7.68E-03	7.24E-01	1.39E-03	7.33E-01	7.68E-03	7.07E-01	1.02E-03	7.16E-01
SILVER	--	9.40E-01	8.58E-01	--	--	--	Crab Tissue	3.69E-01	3.15E-01	3.01E-03	2.36E-01	0.00E+00	2.39E-01	2.75E-03	2.02E-01	0.00E+00	2.04E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	--	Crab Tissue	8.52E-03	8.52E-03	8.96E-04	5.45E-03	8.10E-06	6.36E-03	8.96E-04	5.45E-03	7.38E-06	6.35E-03
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	--	Crab Tissue	2.72E-01	2.53E-01	1.23E-01	1.74E-01	3.00E-04	2.98E-01	1.23E-01	1.62E-01	3.00E-04	2.86E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	--	Crab Tissue	0.00E+00	0.00E+00	3.02E-01	0.00E+00	1.70E-04	3.02E-01	3.02E-01	0.00E+00	1.23E-04	3.02E-01
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	--	Crab Tissue	4.76E+01	4.69E+01	1.37E+00	3.05E+01	7.29E-04	3.18E+01	1.20E+00	3.00E+01	5.37E-04	3.12E+01
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	--	Crab Tissue	5.23E-04	5.23E-04	1.06E-03	3.35E-04	5.43E-06	1.40E-03	1.06E-03	3.35E-04	5.43E-06	1.40E-03
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	--	Crab Tissue	--	--	2.02E-03	0.00E+00	1.22E-05	2.03E-03	1.84E-03	0.00E+00	9.96E-06	1.85E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	--	Crab Tissue	1.46E-03	1.46E-03	1.41E-03	9.32E-04	8.59E-03	1.09E-02	1.41E-03	9.32E-04	6.96E-03	9.30E-03
ACENAPHTHYLENE	Low	3.80E-01	3.80E-01	--	--	--	Crab Tissue	--	--	1.22E-03	0.00E+00	0.00E+00	1.22E-03	1.22E-03	0.00E+00	0.00E+00	1.22E-03
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	--	Crab Tissue	--	--	2.08E-03	0.00E+00	1.94E-06	2.08E-03	1.89E-03	0.00E+00	1.94E-06	1.90E-03
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	--	Crab Tissue	--	--	3.84E-03	0.00E+00	1.13E-05	3.85E-03	3.84E-03	0.00E+00	1.13E-05	3.85E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	--	Crab Tissue	--	--	3.52E-03	0.00E+00	4.13E-06	3.52E-03	3.52E-03	0.00E+00	4.13E-06	3.52E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	--	Crab Tissue	--	--	6.08E-03	0.00E+00	3.97E-06	6.08E-03	6.08E-03	0.00E+00	3.97E-06	6.08E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	--	Crab Tissue	4.15E-03	4.15E-03	2.66E-03	2.65E-03	5.99E-06	5.32E-03	2.66E-03	2.65E-03	5.99E-06	5.32E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	--	Crab Tissue	--	--	8.64E-05	0.00E+00	5.59E-06	9.20E-05	8.64E-05	0.00E+00	5.59E-06	9.20E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	--	Crab Tissue	--	--	3.20E-03	0.00E+00	8.91E-06	3.21E-03	3.20E-03	0.00E+00	8.91E-06	3.21E-03

TABLE C.22
WILDLIFE EXPOSURE MODELING OF DOSES FROM CRAB TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Crab) Uptake				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF/Equation (mg/kg dry wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)[C]	Total Dose (mg/kg bw-day)
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	8.32E-04	0.00E+00	5.91E-06	8.38E-04	4.77E-04	0.00E+00	5.91E-06	4.83E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	--	Crab Tissue	--	--	7.04E-03	0.00E+00	4.54E-05	7.09E-03	7.04E-03	0.00E+00	3.95E-05	7.08E-03
FLUORENE	Low	6.30E-01	3.22E-01	--	--	--	Crab Tissue	--	--	2.02E-03	0.00E+00	0.00E+00	2.02E-03	1.03E-03	0.00E+00	0.00E+00	1.03E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	--	Crab Tissue	--	--	2.78E-03	0.00E+00	5.91E-06	2.79E-03	2.78E-03	0.00E+00	5.91E-06	2.79E-03
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	--	Crab Tissue	8.96E-04	8.96E-04	2.66E-02	5.73E-04	2.92E-05	2.72E-02	2.66E-02	5.73E-04	1.40E-05	2.71E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	--	Crab Tissue	4.55E-03	4.55E-03	6.40E-03	2.91E-03	1.05E-05	9.33E-03	6.40E-03	2.91E-03	9.23E-06	9.32E-03
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	--	Crab Tissue	--	--	4.48E-03	0.00E+00	2.51E-05	4.51E-03	4.48E-03	0.00E+00	2.51E-05	4.51E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	NA[B]	NA[B]	NA[B]	NA[B]	2.75E-02	2.65E-03	7.69E-05	3.02E-02	2.71E-02	2.65E-03	7.69E-05	2.99E-02
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	NA[B]	NA[B]	NA[B]	NA[B]	2.75E-02	2.65E-03	7.69E-05	3.02E-02	2.71E-02	2.65E-03	7.69E-05	2.99E-02
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	NA[B]	NA[B]	NA[B]	NA[B]	4.98E-02	4.75E-03	8.69E-03	6.32E-02	4.84E-02	4.75E-03	7.04E-03	6.02E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	NA[B]	NA[B]	NA[B]	NA[B]	4.98E-02	4.75E-03	8.69E-03	6.32E-02	4.84E-02	4.75E-03	7.04E-03	6.02E-02
PCBS																	
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	--	Crab Tissue	2.22E-01	2.08E-01	1.39E-04	1.42E-01	0.00E+00	1.42E-01	1.26E-04	1.33E-01	0.00E+00	1.33E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	--	Crab Tissue	2.84E-01	2.72E-01	1.86E-04	1.82E-01	0.00E+00	1.82E-01	1.70E-04	1.74E-01	0.00E+00	1.74E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.
C - Analytical results for PCBs in surface water were not available.
D - TEQ maximum and mean EPC values were calculated by multiplying individual dioxin concentrations by a toxicity equivalency factor that relates each to 2,3,7,8-TCDD, and then summing the resulting concentrations.

TABLE C.23
WILDLIFE EXPOSURE MODELING OF DOSES FROM SURFACE WATER TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg wet wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																	
ALUMINUM	--	2.51E+04	2.22E+04	9.04E-02	4.23E-02	--	Fish Tissue	3.22E+01	2.95E+01	8.03E+01	2.06E+01	7.32E-03	1.01E+02	7.10E+01	1.89E+01	3.43E-03	8.98E+01
ANTIMONY	--	3.30E+00	1.42E+00	3.20E-04	2.09E-04	--	Fish Tissue	8.30E-02	5.96E-02	1.06E-02	5.31E-02	2.59E-05	6.37E-02	4.54E-03	3.82E-02	1.69E-05	4.27E-02
ARSENIC	--	7.20E+01	2.76E+01	7.60E-03	4.38E-03	--	Fish Tissue	7.00E-01	6.66E-01	2.30E-01	4.48E-01	6.16E-04	6.79E-01	8.84E-02	4.26E-01	3.55E-04	5.15E-01
BERYLLIUM	--	2.20E+00	1.66E+00	4.70E-05	4.70E-05	--	Fish Tissue	--	--	7.04E-03	0.00E+00	3.81E-06	7.04E-03	5.31E-03	0.00E+00	3.81E-06	5.32E-03
CHROMIUM	--	5.04E+02	2.36E+02	4.90E-03	3.70E-03	--	Fish Tissue	3.60E-01	3.01E-01	1.61E+00	2.30E-01	3.97E-04	1.84E+00	7.56E-01	1.93E-01	3.00E-04	9.49E-01
COBALT	--	5.30E+01	2.94E+01	5.20E-04	3.94E-04	--	Fish Tissue	1.10E-01	9.89E-02	1.70E-01	7.04E-02	4.21E-05	2.40E-01	9.39E-02	6.33E-02	3.19E-05	1.57E-01
COPPER	--	5.95E+02	1.72E+02	2.90E-03	2.34E-03	--	Fish Tissue	3.41E+01	3.05E+01	1.90E+00	2.18E+01	2.35E-04	2.37E+01	5.50E-01	1.95E+01	1.90E-04	2.01E+01
IRON	--	1.20E+05	7.64E+04	2.12E-01	1.04E-01	--	Fish Tissue	1.42E+02	1.32E+02	3.84E+02	9.09E+01	1.72E-02	4.75E+02	2.44E+02	8.42E+01	8.40E-03	3.29E+02
LEAD	--	1.28E+03	3.51E+02	5.60E-04	1.93E-04	--	Fish Tissue	7.80E-01	7.74E-01	4.10E+00	4.99E-01	4.54E-05	4.60E+00	1.12E+00	4.95E-01	1.56E-05	1.62E+00
MANGANESE	--	1.59E+03	1.27E+03	1.98E-01	7.01E-02	--	Fish Tissue	1.47E+01	1.42E+01	5.09E+00	9.41E+00	1.60E-02	1.45E+01	4.06E+00	9.11E+00	5.68E-03	1.32E+01
MERCURY	--	1.70E+00	6.86E-01	6.30E-05	5.73E-05	--	Fish Tissue	3.40E-02	3.40E-02	5.44E-03	2.18E-02	5.10E-06	2.72E-02	2.20E-03	2.18E-02	4.64E-06	2.40E-02
NICKEL	--	5.64E+01	4.27E+01	7.90E-03	6.36E-03	--	Fish Tissue	1.50E-01	1.36E-01	1.80E-01	9.60E-02	6.40E-04	2.77E-01	1.37E-01	8.72E-02	5.15E-04	2.24E-01
SELENIUM	--	1.23E+01	4.61E+00	2.45E-02	1.35E-02	--	Fish Tissue	1.80E+00	1.70E+00	3.94E-02	1.15E+00	1.98E-03	1.19E+00	1.48E-02	1.09E+00	1.09E-03	1.11E+00
THALLIUM	--	9.80E-01	5.50E-01	1.30E-04	5.62E-05	--	Fish Tissue	9.50E-03	9.50E-03	3.14E-03	6.08E-03	1.05E-05	9.23E-03	1.76E-03	6.08E-03	4.55E-06	7.84E-03
TIN	--	2.00E+02	8.52E+01	3.20E-03	2.45E-03	--	Fish Tissue	2.80E-01	2.73E-01	6.40E-01	1.79E-01	2.59E-04	8.19E-01	2.73E-01	1.74E-01	1.99E-04	4.47E-01
VANADIUM	--	1.70E+02	1.16E+02	2.80E-03	1.08E-03	--	Fish Tissue	0.00E+00	0.00E+00	5.44E-01	0.00E+00	2.27E-04	5.44E-01	3.72E-01	0.00E+00	8.71E-05	3.72E-01
ZINC	--	2.73E+03	9.99E+02	8.46E-02	1.64E-02	--	Fish Tissue	3.21E+01	3.11E+01	8.74E+00	2.05E+01	6.85E-03	2.93E+01	3.20E+00	1.99E+01	1.33E-03	2.31E+01
PAHS																	
1-METHYLNAPHTHALENE	Low	3.30E+00	1.33E+00	2.00E-04	6.77E-05	--	Fish Tissue	--	--	1.06E-02	0.00E+00	1.62E-05	1.06E-02	4.25E-03	0.00E+00	5.48E-06	4.25E-03
2-METHYLNAPHTHALENE	Low	6.50E+00	2.26E+00	3.50E-04	8.77E-05	--	Fish Tissue	5.00E-03	5.00E-03	2.08E-02	3.20E-03	2.84E-05	2.40E-02	7.23E-03	3.20E-03	7.10E-06	1.04E-02
ACENAPHTHENE	Low	5.90E+00	3.37E+00	9.04E-02	4.23E-02	--	Fish Tissue	1.10E-02	9.68E-03	1.89E-02	7.04E-03	7.32E-03	3.32E-02	1.08E-02	6.19E-03	3.43E-03	2.04E-02
ACENAPHTHYLENE	Low	4.10E+01	5.97E+00	2.40E-04	6.96E-05	--	Fish Tissue	9.00E-03	8.80E-03	1.31E-01	5.76E-03	1.94E-05	1.37E-01	1.91E-02	5.63E-03	5.64E-06	2.47E-02
ANTHRACENE	Low	2.10E+01	8.93E+00	1.80E-03	1.37E-04	--	Fish Tissue	--	--	6.72E-02	0.00E+00	1.46E-04	6.73E-02	2.86E-02	0.00E+00	1.11E-05	2.86E-02
BENZO(A)ANTHRACENE	High	6.10E+01	1.37E+01	8.70E-03	9.80E-04	--	Fish Tissue	--	--	1.95E-01	0.00E+00	7.05E-04	1.96E-01	4.37E-02	0.00E+00	7.94E-05	4.38E-02
BENZO(A)PYRENE	High	5.60E+01	1.25E+01	6.80E-03	7.59E-04	--	Fish Tissue	--	--	1.79E-01	0.00E+00	5.51E-04	1.80E-01	4.01E-02	0.00E+00	6.15E-05	4.02E-02
BENZO(B)FLUORANTHENE	High	5.30E+01	1.27E+01	8.00E-03	9.84E-04	--	Fish Tissue	--	--	1.70E-01	0.00E+00	6.48E-04	1.70E-01	4.05E-02	0.00E+00	7.97E-05	4.06E-02
BENZO(G,H,I)PERYLENE	High	2.00E+01	7.11E+00	9.60E-03	1.13E-03	--	Fish Tissue	8.40E-04	8.40E-04	6.40E-02	5.38E-04	7.78E-04	6.53E-02	2.27E-02	5.38E-04	9.17E-05	2.34E-02
BENZO(K)FLUORANTHENE	High	1.80E+01	4.55E+00	9.20E-03	1.02E-03	--	Fish Tissue	--	--	5.76E-02	0.00E+00	7.45E-04	5.83E-02	1.45E-02	0.00E+00	8.27E-05	1.46E-02
CHRYSENE	High	6.30E+01	1.27E+01	9.60E-03	1.09E-03	--	Fish Tissue	--	--	2.02E-01	0.00E+00	7.78E-04	2.02E-01	4.05E-02	0.00E+00	8.79E-05	4.06E-02
DIBENZO(A,H)ANTHRACENE	High	6.30E+00	2.46E+00	1.10E-02	1.22E-03	--	Fish Tissue	--	--	2.02E-02	0.00E+00	8.91E-04	2.11E-02	7.86E-03	0.00E+00	9.88E-05	7.96E-03
FLUORANTHENE	Low	1.40E+02	3.02E+01	4.70E-03	4.32E-04	--	Fish Tissue	5.90E-02	5.10E-02	4.48E-01	3.78E-02	3.81E-04	4.86E-01	9.67E-02	3.26E-02	3.50E-05	1.29E-01
INDENO(1,2,3-CD)PYRENE	High	2.50E+01	6.97E+00	9.90E-03	1.16E-03	--	Fish Tissue	3.20E-03	3.20E-03	8.00E-02	2.05E-03	8.02E-04	8.28E-02	2.23E-02	2.05E-03	9.36E-05	2.44E-02
NAPHTHALENE	Low	7.20E+03	2.15E+03	6.70E-03	1.27E-03	--	Fish Tissue	1.90E-02	1.82E-02	2.30E+01	1.22E-02	5.43E-04	2.31E+01	6.88E+00	1.17E-02	1.03E-04	6.89E+00
PHENANTHRENE	Low	2.00E+01	1.47E+01	1.20E-03	1.43E-04	--	Fish Tissue	1.00E-02	9.69E-03	6.40E-02	6.40E-03	9.72E-05	7.05E-02	4.69E-02	6.20E-03	1.16E-05	5.31E-02
PYRENE	High	5.90E+01	1.57E+01	4.70E-03	4.55E-04	--	Fish Tissue	5.40E-03	5.40E-03	1.89E-01	3.46E-03	3.81E-04	1.93E-01	5.01E-02	3.46E-03	3.69E-05	5.36E-02
TOTAL HMW PAH (ND = DL)	--	2.88E+02	8.66E+01	7.59E-02	6.13E-03	NA[B]	--	NA[B]	NA[B]	1.16E+00	6.04E-03	6.28E-03	1.17E+00	2.82E-01	6.04E-03	7.12E-04	2.89E-01
TOTAL LMW PAH (ND = DL)	--	7.28E+03	2.20E+03	8.08E-03	2.26E-03	NA[B]	--	NA[B]	NA[B]	2.38E+01	7.23E-02	8.55E-03	2.39E+01	7.09E+00	6.55E-02	3.61E-03	7.16E+00

TABLE C.23
WILDLIFE EXPOSURE MODELING OF DOSES FROM SURFACE WATER TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA
COKE POINT OFFSHORE AREA GROUPING

Exposure Parameters

Sediment Ingestion Rate (kg wet wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item Uptake (Fish)				Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	BAF (mg/L to mg/kg wet wt.)	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
PCBS																	
TOTAL PCBS (ND = 0)	--	4.60E-01	1.80E-01	--	--	--	Fish Tissue	5.37E-01	5.20E-01	1.47E-03	3.44E-01	0.00E+00	3.45E-01	5.76E-04	3.33E-01	0.00E+00	3.34E-01
TOTAL PCBS (ND = DL)	--	4.89E-01	2.65E-01	--	--	--	Fish Tissue	5.57E-01	5.40E-01	1.56E-03	3.56E-01	0.00E+00	3.58E-01	8.48E-04	3.46E-01	0.00E+00	3.47E-01
VOLATILES																	
1,2-DICHLOROBENZENE	--	--	--	2.90E-03	2.90E-03	8.51E+01	SWBAF	2.47E-01	2.47E-01	0.00E+00	1.58E-01	2.35E-04	1.58E-01	0.00E+00	1.58E-01	2.35E-04	1.58E-01
BENZENE	--	7.90E-02	7.90E-02	7.20E-02	1.25E-02	1.18E+01	SWBAF	8.50E-01	1.47E-01	2.53E-04	5.44E-01	5.83E-03	5.50E-01	2.53E-04	9.42E-02	1.01E-03	9.55E-02
CHLOROFORM	--	--	--	1.00E-03	1.00E-03	9.26E+00	SWBAF	9.26E-03	9.26E-03	0.00E+00	5.93E-03	8.10E-05	6.01E-03	0.00E+00	5.93E-03	8.10E-05	6.01E-03
ETHYLBENZENE	--	4.90E-03	4.90E-03	4.00E-02	2.59E-03	5.56E+01	SWBAF	2.22E+00	1.44E-01	1.57E-05	1.42E+00	3.24E-03	1.43E+00	1.57E-05	9.23E-02	2.10E-04	9.25E-02
TOLUENE	--	5.70E-02	5.70E-02	1.50E-02	2.79E-03	2.94E+01	SWBAF	4.41E-01	8.20E-02	1.82E-04	2.82E-01	1.22E-03	2.84E-01	1.82E-04	5.25E-02	2.26E-04	5.29E-02
TOTAL XYLENES	--	--	--	6.50E-03	4.44E-03	5.32E+01	SWBAF	3.46E-01	2.36E-01	0.00E+00	2.21E-01	5.27E-04	2.22E-01	0.00E+00	1.51E-01	3.60E-04	1.52E-01

A - Testing was not completed for dioxins, cyanide, PCBs, and organotins in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

TABLE C.24
WILDLIFE EXPOSURE MODELING OF DOSES FROM FISH TO PISCIVOROUS MAMMALS (RIVER OTTER) FROM MEDIA FOR THE PATAPSCO RIVER BACKGROUND GROUPING

Exposure Parameters

Soil Ingestion Rate (kg dry wt./kg bw-day):	3.20E-03	kg/kg-day
Food Ingestion Rate (kg wet wt./kg bw-day):	6.40E-01	kg/kg-day
Water Ingestion Rate (L/kg bw-day):	8.10E-02	L/kg-day

Chemical[A]	Chemical Type (Molecular Weight)	Sediment Concentration (mg/kg dry wt.)		Water Concentration (mg/L)		Food Item (Fish) Uptake			Screening Level Scenario Doses				Reasonable Maximum Scenario Doses			
		Screening Level	Reasonable Maximum	Screening Level	Reasonable Maximum	Source	Screening Level Food Item Tissue Concentration (mg/kg wet wt.)	Reasonable Maximum Food Item Tissue Concentration (mg/kg wet wt.)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)	Dose from Sediment (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Dose from Water (mg/kg bw-day)	Total Dose (mg/kg bw-day)
METALS																
ALUMINUM	--	2.04E+04	2.04E+04	1.06E-01	8.59E-02	Fish Tissue	8.36E+01	6.93E+01	6.53E+01	5.35E+01	8.59E-03	1.19E+02	6.53E+01	4.44E+01	6.96E-03	1.10E+02
ANTIMONY	--	1.70E+00	1.70E+00	3.00E-04	2.53E-04	Fish Tissue	6.90E-02	5.27E-02	5.44E-03	4.42E-02	2.43E-05	4.96E-02	5.44E-03	3.37E-02	2.05E-05	3.92E-02
ARSENIC	--	1.62E+01	1.07E+01	6.40E-03	4.69E-03	Fish Tissue	8.10E-01	8.02E-01	5.18E-02	5.18E-01	5.18E-04	5.71E-01	3.43E-02	5.13E-01	3.80E-04	5.48E-01
BERYLLIUM	--	1.70E+00	1.70E+00	3.80E-05	3.80E-05	Fish Tissue	--	--	5.44E-03	0.00E+00	3.08E-06	5.44E-03	5.44E-03	0.00E+00	3.08E-06	5.44E-03
CHROMIUM	--	2.25E+02	2.04E+02	1.42E-02	1.26E-02	Fish Tissue	6.80E-01	6.80E-01	7.20E-01	4.35E-01	1.15E-03	1.16E+00	6.54E-01	4.35E-01	1.02E-03	1.09E+00
COBALT	--	1.98E+01	1.98E+01	6.80E-04	4.83E-04	Fish Tissue	1.10E-01	1.07E-01	6.34E-02	7.04E-02	5.51E-05	1.34E-01	6.34E-02	6.82E-02	3.91E-05	1.32E-01
COPPER	--	1.05E+02	9.16E+01	2.60E-03	2.35E-03	Fish Tissue	2.57E+01	2.30E+01	3.36E-01	1.64E+01	2.11E-04	1.68E+01	2.93E-01	1.47E+01	1.90E-04	1.50E+01
IRON	--	4.38E+04	2.74E+04	2.46E-01	1.54E-01	Fish Tissue	1.26E+02	1.08E+02	1.40E+02	8.06E+01	1.99E-02	2.21E+02	8.77E+01	6.91E+01	1.25E-02	1.57E+02
LEAD	--	1.21E+02	1.06E+02	4.60E-04	3.52E-04	Fish Tissue	4.10E-01	3.82E-01	3.87E-01	2.62E-01	3.73E-05	6.50E-01	3.38E-01	2.45E-01	2.85E-05	5.83E-01
MANGANESE	--	1.26E+03	1.26E+03	8.54E-02	8.14E-02	Fish Tissue	2.38E+01	2.04E+01	4.03E+00	1.52E+01	6.92E-03	1.93E+01	4.03E+00	1.31E+01	6.60E-03	1.71E+01
MERCURY	--	3.90E-01	2.27E-01	3.90E-05	3.90E-05	Fish Tissue	4.50E-02	3.82E-02	1.25E-03	2.88E-02	3.16E-06	3.01E-02	7.26E-04	2.44E-02	3.16E-06	2.52E-02
NICKEL	--	3.74E+01	2.45E+01	6.60E-03	5.66E-03	Fish Tissue	2.40E-01	2.25E-01	1.20E-01	1.54E-01	5.35E-04	2.74E-01	7.85E-02	1.44E-01	4.58E-04	2.23E-01
SELENIUM	--	2.40E+00	2.40E+00	1.71E-02	1.26E-02	Fish Tissue	1.40E+00	1.35E+00	7.68E-03	8.96E-01	1.39E-03	9.05E-01	7.68E-03	8.61E-01	1.02E-03	8.70E-01
THALLIUM	--	2.80E-01	2.80E-01	1.00E-04	9.11E-05	Fish Tissue	--	--	8.96E-04	0.00E+00	8.10E-06	9.04E-04	8.96E-04	0.00E+00	7.38E-06	9.03E-04
TIN	--	3.85E+01	3.85E+01	3.70E-03	3.70E-03	Fish Tissue	2.90E-01	2.86E-01	1.23E-01	1.86E-01	3.00E-04	3.09E-01	1.23E-01	1.83E-01	3.00E-04	3.07E-01
VANADIUM	--	9.44E+01	9.44E+01	2.10E-03	1.52E-03	Fish Tissue	--	--	3.02E-01	0.00E+00	1.70E-04	3.02E-01	3.02E-01	0.00E+00	1.23E-04	3.02E-01
ZINC	--	4.29E+02	3.76E+02	9.00E-03	6.64E-03	Fish Tissue	2.43E+01	2.41E+01	1.37E+00	1.56E+01	7.29E-04	1.69E+01	1.20E+00	1.54E+01	5.37E-04	1.66E+01
PAHS																
1-METHYLNAPHTHALENE	Low	3.30E-01	3.30E-01	6.70E-05	6.70E-05	Fish Tissue	--	--	1.06E-03	0.00E+00	5.43E-06	1.06E-03	1.06E-03	0.00E+00	5.43E-06	1.06E-03
2-METHYLNAPHTHALENE	Low	6.30E-01	5.74E-01	1.50E-04	1.23E-04	Fish Tissue	4.40E-03	4.40E-03	2.02E-03	2.82E-03	1.22E-05	4.84E-03	1.84E-03	2.82E-03	9.96E-06	4.66E-03
ACENAPHTHENE	Low	4.40E-01	4.40E-01	1.06E-01	8.59E-02	Fish Tissue	5.10E-03	5.10E-03	1.41E-03	3.26E-03	8.59E-03	1.33E-02	1.41E-03	3.26E-03	6.96E-03	1.16E-02
ANTHRACENE	Low	6.50E-01	5.92E-01	2.40E-05	2.40E-05	Fish Tissue	--	--	2.08E-03	0.00E+00	1.94E-06	2.08E-03	1.89E-03	0.00E+00	1.94E-06	1.90E-03
BENZO(A)ANTHRACENE	High	1.20E+00	1.20E+00	1.40E-04	1.40E-04	Fish Tissue	--	--	3.84E-03	0.00E+00	1.13E-05	3.85E-03	3.84E-03	0.00E+00	1.13E-05	3.85E-03
BENZO(A)PYRENE	High	1.10E+00	1.10E+00	5.10E-05	5.10E-05	Fish Tissue	--	--	3.52E-03	0.00E+00	4.13E-06	3.52E-03	3.52E-03	0.00E+00	4.13E-06	3.52E-03
BENZO(B)FLUORANTHENE	High	1.90E+00	1.90E+00	4.90E-05	4.90E-05	Fish Tissue	--	--	6.08E-03	0.00E+00	3.97E-06	6.08E-03	6.08E-03	0.00E+00	3.97E-06	6.08E-03
BENZO(G,H,I)PERYLENE	High	8.30E-01	8.30E-01	7.40E-05	7.40E-05	Fish Tissue	--	--	2.66E-03	0.00E+00	5.99E-06	2.66E-03	2.66E-03	0.00E+00	5.99E-06	2.66E-03
BENZO(K)FLUORANTHENE	High	2.70E-02	2.70E-02	6.90E-05	6.90E-05	Fish Tissue	--	--	8.64E-05	0.00E+00	5.59E-06	9.20E-05	8.64E-05	0.00E+00	5.59E-06	9.20E-05
CHRYSENE	High	1.00E+00	1.00E+00	1.10E-04	1.10E-04	Fish Tissue	--	--	3.20E-03	0.00E+00	8.91E-06	3.21E-03	3.20E-03	0.00E+00	8.91E-06	3.21E-03
DIBENZO(A,H)ANTHRACENE	High	2.60E-01	1.49E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	8.32E-04	0.00E+00	5.91E-06	8.38E-04	4.77E-04	0.00E+00	5.91E-06	4.83E-04
FLUORANTHENE	Low	2.20E+00	2.20E+00	5.60E-04	4.88E-04	Fish Tissue	--	--	7.04E-03	0.00E+00	4.54E-05	7.09E-03	7.04E-03	0.00E+00	3.95E-05	7.08E-03
INDENO(1,2,3-CD)PYRENE	High	8.70E-01	8.70E-01	7.30E-05	7.30E-05	Fish Tissue	--	--	2.78E-03	0.00E+00	5.91E-06	2.79E-03	2.78E-03	0.00E+00	5.91E-06	2.79E-03
NAPHTHALENE	Low	8.30E+00	8.30E+00	3.60E-04	1.73E-04	Fish Tissue	--	--	2.66E-02	0.00E+00	2.92E-05	2.66E-02	2.66E-02	0.00E+00	1.40E-05	2.66E-02
PHENANTHRENE	Low	2.00E+00	2.00E+00	1.30E-04	1.14E-04	Fish Tissue	1.00E-02	9.68E-03	6.40E-03	6.40E-03	1.05E-05	1.28E-02	6.40E-03	6.19E-03	9.23E-06	1.26E-02
PYRENE	High	1.40E+00	1.40E+00	3.10E-04	3.10E-04	Fish Tissue	--	--	4.48E-03	0.00E+00	2.51E-05	4.51E-03	4.48E-03	0.00E+00	2.51E-05	4.51E-03
TOTAL HMW PAH (ND = 0)	--	8.56E+00	8.56E+00	7.18E-04	7.18E-04	Fish Tissue	NA[B]	NA[B]	2.75E-02	0.00E+00	7.69E-05	2.76E-02	2.71E-02	0.00E+00	7.69E-05	2.72E-02
TOTAL HMW PAH (ND = DL)	--	8.67E+00	8.67E+00	1.29E-03	1.29E-03	Fish Tissue	NA[B]	NA[B]	2.75E-02	0.00E+00	7.69E-05	2.76E-02	2.71E-02	0.00E+00	7.69E-05	2.72E-02
TOTAL LMW PAH (ND = 0)	--	1.56E+01	1.56E+01	7.89E-04	5.96E-04	Fish Tissue	NA[B]	NA[B]	4.66E-02	1.25E-02	8.69E-03	6.77E-02	4.62E-02	1.23E-02	7.04E-03	6.55E-02
TOTAL LMW PAH (ND = DL)	--	1.56E+01	1.56E+01	1.72E-03	1.61E-03	Fish Tissue	NA[B]	NA[B]	4.66E-02	1.25E-02	8.69E-03	6.77E-02	4.62E-02	1.23E-02	7.04E-03	6.55E-02
PCBS																
TOTAL PCBS (ND = 0)	--	4.34E-02	3.94E-02	--	--	Fish Tissue	4.54E-01	4.54E-01	1.39E-04	2.91E-01	0.00E+00	2.91E-01	1.26E-04	2.91E-01	0.00E+00	2.91E-01
TOTAL PCBS (ND = DL)	--	5.83E-02	5.32E-02	--	--	Fish Tissue	4.74E-01	4.74E-01	1.86E-04	3.03E-01	0.00E+00	3.04E-01	1.70E-04	3.03E-01	0.00E+00	3.04E-01

A - Testing was not completed for dioxins, cyanide, organotins, and VOCs in sediment and dioxins, cyanide, PCBs, organotins, and VOCs in surface water.
B - Doses for total HMW and LMW PAHs are based on summed uptake and intake of individual compounds.

APPENDIX D:

SCREENING LEVELS

TABLE D.1
CALCULATED SITE-SPECIFIC SCREENING LEVELS FOR SEDIMENT
COKE POINT OFFSHORE AREA

Constituent[1]	CAS No.	Adult Calculated Concentration		Adolescent Calculated Concentration		Child Calculated Concentration		Watermen Calculated Concentration		Selected Screening Level[1]
		Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	(mg/kg)
Metals										
ALUMINUM	7429-90-5	NA	2.95E+07	NA	6.63E+06	NA	3.92E+06	NA	8.40E+06	NA
ANTIMONY	7440-36-0	NA	1.77E+03	NA	3.98E+02	NA	2.35E+02	NA	5.04E+02	2.35E+02
ARSENIC	7440-38-2	1.53E+02	2.95E+03	1.03E+02	6.63E+02	1.02E+02	3.92E+02	4.36E+01	8.40E+02	4.36E+01
BARIUM	7440-39-3	NA	4.13E+05	NA	9.28E+04	NA	5.49E+04	NA	1.18E+05	5.49E+04
BERYLLIUM	7440-41-7	NA	4.13E+02	NA	9.28E+01	NA	5.49E+01	NA	1.18E+02	5.49E+01
CADMIUM	7440-43-9	NA	7.37E+03	NA	1.66E+03	NA	9.80E+02	NA	2.10E+03	9.80E+02
CHROMIUM	7440-47-3	3.44E+01	2.21E+03	2.32E+01	4.97E+02	2.29E+01	2.94E+02	9.80E+00	6.30E+02	9.80E+00
CHROMIUM, TRIVALENT	16065-83-1	NA	5.75E+05	NA	1.29E+05	NA	7.64E+04	NA	1.64E+05	7.64E+04
COBALT	7440-48-4	NA	8.84E+03	NA	1.99E+03	NA	1.18E+03	NA	2.52E+03	1.18E+03
COPPER	7440-50-8	NA	1.18E+06	NA	2.65E+05	NA	1.57E+05	NA	3.36E+05	1.57E+05
CYANIDE	57-12-5	NA	5.89E+05	NA	1.33E+05	NA	7.84E+04	NA	1.68E+05	7.84E+04
IRON	7439-89-6	NA	2.06E+07	NA	4.64E+06	NA	2.74E+06	NA	5.88E+06	NA
LEAD	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00
MANGANESE	7439-96-5	NA	2.83E+04	NA	6.37E+03	NA	3.76E+03	NA	8.06E+03	3.76E+03
MERCURY	7439-97-6	NA	6.19E+02	NA	1.39E+02	NA	8.23E+01	NA	1.76E+02	8.23E+01
NICKEL	7440-02-0	NA	2.36E+04	NA	5.31E+03	NA	3.13E+03	NA	6.72E+03	3.13E+03
SELENIUM	7782-49-2	NA	1.47E+05	NA	3.32E+04	NA	1.96E+04	NA	4.20E+04	1.96E+04
SILVER	7440-22-4	NA	5.89E+03	NA	1.33E+03	NA	7.84E+02	NA	1.68E+03	7.84E+02
THALLIUM	7440-28-0	NA	NA	NA	NA	NA	NA	NA	NA	0.00E+00
TIN	7440-31-5	NA	1.77E+07	NA	3.98E+06	NA	2.35E+06	NA	5.04E+06	NA
VANADIUM	7440-62-2	NA	1.47E+05	NA	3.32E+04	NA	1.96E+04	NA	4.20E+04	1.96E+04
ZINC	7440-66-6	NA	8.84E+06	NA	1.99E+06	NA	1.18E+06	NA	2.52E+06	NA
Polycyclic Aromatic Hydrocarbons (PAHs)										
1-METHYLNAPHTHALENE	90-12-0	1.82E+03	1.59E+05	1.23E+03	3.57E+04	1.21E+03	2.11E+04	5.20E+02	4.52E+04	5.20E+02
2-METHYLNAPHTHALENE	91-57-6	NA	9.07E+03	NA	2.04E+03	NA	1.21E+03	NA	2.58E+03	1.21E+03
ACENAPHTHENE	83-32-9	NA	1.36E+05	NA	3.06E+04	NA	1.81E+04	NA	3.88E+04	1.81E+04
ACENAPHTHYLENE	208-96-8	NA	1.36E+05	NA	3.06E+04	NA	1.81E+04	NA	3.88E+04	1.81E+04
ANTHRACENE	120-12-7	NA	6.80E+05	NA	1.53E+05	NA	9.04E+04	NA	1.94E+05	9.04E+04
BENZO(A)ANTHRACENE	56-55-3	7.25E+01	NA	1.63E+01	NA	9.61E+00	NA	2.07E+01	NA	9.61E+00
BENZO(A)PYRENE	50-32-8	7.25E+00	NA	1.63E+00	NA	9.61E-01	NA	2.07E+00	NA	9.61E-01
BENZO(B)FLUORANTHENE	205-99-2	7.25E+01	NA	1.63E+01	NA	9.61E+00	NA	2.07E+01	NA	9.61E+00
BENZO(GHI)PERYLENE	191-24-2	NA	6.80E+04	NA	1.53E+04	NA	9.04E+03	NA	1.94E+04	9.04E+03
BENZO(K)FLUORANTHENE	207-08-9	7.25E+02	NA	1.63E+02	NA	9.61E+01	NA	2.07E+02	NA	9.61E+01
CHRYSENE	218-01-9	7.25E+03	NA	1.63E+03	NA	9.61E+02	NA	2.07E+03	NA	9.61E+02
DIBENZO(A,H)ANTHRACENE	53-70-3	7.25E+00	NA	1.63E+00	NA	9.61E-01	NA	2.07E+00	NA	9.61E-01
FLUORANTHENE	206-44-0	NA	9.07E+04	NA	2.04E+04	NA	1.21E+04	NA	2.58E+04	1.21E+04
FLUORENE	86-73-7	NA	9.07E+04	NA	2.04E+04	NA	1.21E+04	NA	2.58E+04	1.21E+04
INDENO(1,2,3-CD)PYRENE	193-39-5	7.25E+01	NA	1.63E+01	NA	9.61E+00	NA	2.07E+01	NA	9.61E+00
NAPHTHALENE	91-20-3	NA	4.53E+04	NA	1.02E+04	NA	6.03E+03	NA	1.29E+04	6.03E+03
PHENANTHRENE	85-01-8	NA	6.80E+04	NA	1.53E+04	NA	9.04E+03	NA	1.94E+04	9.04E+03
PYRENE	129-00-0	NA	6.80E+04	NA	1.53E+04	NA	9.04E+03	NA	1.94E+04	9.04E+03

TABLE D.1
CALCULATED SITE-SPECIFIC SCREENING LEVELS FOR SEDIMENT
COKE POINT OFFSHORE AREA

Constituent[1]	CAS No.	Adult Calculated Concentration		Adolescent Calculated Concentration		Child Calculated Concentration		Watermen Calculated Concentration		Selected Screening Level[1]
		Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	(mg/kg)
Volatile Organic Compounds										
1,1,1-TRICHLOROETHANE	71-55-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-TETRACHLOROETHANE	79-34-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-TRICHLOROETHANE	79-00-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-DICHLOROETHANE	75-34-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-DICHLOROETHENE	75-35-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROBENZENE	95-50-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROETHANE	107-06-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROPROPANE	78-87-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-DICHLOROBENZENE	541-73-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-BUTANONE (MEK)	78-93-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-CHLOROETHYL VINYL ETHER	110-75-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ACROLEIN	107-02-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ACRYLONITRILE	107-13-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	71-43-2	2.50E+05	2.36E+06	1.69E+05	5.31E+05	1.66E+05	3.13E+05	7.13E+04	6.72E+05	7.13E+04
BROMODICHLOROMETHANE	75-27-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
BROMOFORM	75-25-2	8.71E+03	5.89E+04	5.88E+03	1.33E+04	5.79E+03	7.84E+03	2.48E+03	1.68E+04	2.48E+03
BROMOMETHANE	74-83-9	NA	NA	NA	NA	NA	NA	NA	NA	NA
CARBON TETRACHLORIDE	56-23-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROBENZENE	108-90-7	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROETHANE	75-00-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	67-66-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	74-87-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
CIS-1,3-DICHLOROPROPENE	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
DIBROMOCHLOROMETHANE	124-48-1	8.19E+02	5.89E+04	5.53E+02	1.33E+04	5.44E+02	7.84E+03	2.33E+02	1.68E+04	2.33E+02
DICHLORODIFLUOROMETHANE	75-71-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	2.08E+04	9.82E+05	1.41E+04	2.21E+05	1.39E+04	1.31E+05	5.94E+03	2.80E+05	5.94E+03
METHYLENE CHLORIDE	75-09-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
M-XYLENE & P-XYLENE	136777-61-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
TETRACHLOROETHENE	127-18-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	108-88-3	NA	7.86E+06	NA	1.77E+06	NA	1.04E+06	NA	2.24E+06	1.04E+06
TRANS-1,2-DICHLOROETHENE	156-60-5	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRANS-1,3-DICHLOROPROPENE	10061-02-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRICHLOROETHENE	79-01-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
TRICHLOROFLUOROMETHANE	75-69-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
VINYL CHLORIDE	75-01-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
XYLENES (TOTAL)	1330-20-7	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB Congeners										
TOTAL PCBS	TOTPCB_NDDL	3.78E-03	NA	2.55E-03	NA	2.51E-03	NA	1.08E-03	NA	1.08E-03
Dioxin										
Total Dioxin	WHOTEQNDDL	1.76E-03	9.82E-03	1.19E-03	2.21E-03	1.17E-03	1.31E-03	5.03E-04	2.80E-03	5.03E-04

TABLE D.1
CALCULATED SITE-SPECIFIC SCREENING LEVELS FOR SEDIMENT
COKE POINT OFFSHORE AREA

Constituent[1]	CAS No.	Adult Calculated Concentration		Adolescent Calculated Concentration		Child Calculated Concentration		Watermen Calculated Concentration		Selected Screening Level[1]
		Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	Cancer (mg/kg)	Non-Cancer (mg/kg)	(mg/kg)
Butyltins										
DIBUTYLTIN	1002-53-5	NA	8.84E+02	NA	1.99E+02	NA	1.18E+02	NA	2.52E+02	1.18E+02
MONOBUTYLTIN	2406-65-7	NA	8.84E+02	NA	1.99E+02	NA	1.18E+02	NA	2.52E+02	1.18E+02
TETRABUTYLTIN	1461-25-2	NA	8.84E+02	NA	1.99E+02	NA	1.18E+02	NA	2.52E+02	1.18E+02
TRIBUTYLTIN	688-73-3	NA	8.84E+02	NA	1.99E+02	NA	1.18E+02	NA	2.52E+02	1.18E+02

Notes:
(1) Selected Screening Level for inorganics is "NA" due to calculated values are greater than equilibrium (i.e. 1E+06 mg/kg).

TABLE D.2
CALCULATED SITE-SPECIFIC SCREENING LEVELS FOR SURFACE WATER
COKE POINT OFFSHORE AREA

Constituent	CAS No.	Adult Calculated Concentration		Adolescent Calculated Concentration		Child Calculated Concentration		Watermen Calculated Concentration		Selected Screening Level
		Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	(ug/L)
Metals										
ALUMINUM	7429-90-5	NA	2.22E+06	NA	1.92E+06	NA	1.56E+06	NA	1.24E+06	1.24E+06
ANTIMONY	7440-36-0	NA	1.33E+02	NA	1.15E+02	NA	9.33E+01	NA	7.44E+01	7.44E+01
ARSENIC	7440-38-2	3.45E+01	6.65E+02	8.97E+01	5.77E+02	1.21E+02	4.67E+02	1.93E+01	3.72E+02	1.93E+01
BARIUM	7440-39-3	NA	3.11E+04	NA	2.69E+04	NA	2.18E+04	NA	1.74E+04	1.74E+04
BERYLLIUM	7440-41-7	NA	3.11E+01	NA	2.69E+01	NA	2.18E+01	NA	1.74E+01	1.74E+01
CADMIUM	7440-43-9	NA	5.54E+01	NA	4.81E+01	NA	3.89E+01	NA	3.10E+01	3.10E+01
CHROMIUM	7440-47-3	NA	4.16E+04	NA	3.60E+04	NA	2.92E+04	NA	2.33E+04	2.33E+04
CHROMIUM, TRIVALENT	16065-83-1	NA	4.32E+04	NA	3.75E+04	NA	3.03E+04	NA	2.42E+04	2.42E+04
COBALT	7440-48-4	NA	1.66E+03	NA	1.44E+03	NA	1.17E+03	NA	9.31E+02	9.31E+02
COPPER	7440-50-8	NA	8.87E+04	NA	7.69E+04	NA	6.22E+04	NA	4.96E+04	4.96E+04
CYANIDE	57-12-5	NA	4.44E+04	NA	3.84E+04	NA	3.11E+04	NA	2.48E+04	2.48E+04
IRON	7439-89-6	NA	1.55E+06	NA	1.35E+06	NA	1.09E+06	NA	8.69E+05	8.69E+05
LEAD	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA	1.50E+01
MANGANESE	7439-96-5	NA	2.13E+03	NA	1.85E+03	NA	1.49E+03	NA	1.19E+03	1.19E+03
MERCURY	7439-97-6	NA	4.66E+01	NA	4.04E+01	NA	3.27E+01	NA	2.61E+01	2.61E+01
NICKEL	7440-02-0	NA	8.87E+03	NA	7.69E+03	NA	6.22E+03	NA	4.96E+03	4.96E+03
SELENIUM	7782-49-2	NA	1.11E+04	NA	9.61E+03	NA	7.78E+03	NA	6.20E+03	6.20E+03
SILVER	7440-22-4	NA	7.39E+02	NA	6.41E+02	NA	5.18E+02	NA	4.14E+02	4.14E+02
THALLIUM	7440-28-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
TIN	7440-31-5	NA	1.33E+06	NA	1.15E+06	NA	9.33E+05	NA	7.44E+05	7.44E+05
VANADIUM	7440-62-2	NA	1.11E+04	NA	9.61E+03	NA	7.78E+03	NA	6.20E+03	6.20E+03
ZINC	7440-66-6	NA	1.11E+06	NA	9.61E+05	NA	7.78E+05	NA	6.20E+05	6.20E+05
Polycyclic Aromatic Hydrocarbons (PAHs)										
1-METHYLNAPHTHALENE	90-12-0	1.92E+01	1.67E+03	4.98E+01	1.45E+03	6.72E+01	1.17E+03	1.07E+01	9.33E+02	1.07E+01
2-METHYLNAPHTHALENE	91-57-6	NA	9.67E+01	NA	8.39E+01	NA	6.78E+01	NA	5.41E+01	5.41E+01
ACENAPHTHENE	83-32-9	NA	1.55E+03	NA	1.34E+03	NA	1.09E+03	NA	8.66E+02	8.66E+02
ACENAPHTHYLENE	208-96-8	NA	1.46E+03	NA	1.27E+03	NA	1.02E+03	NA	8.17E+02	8.17E+02
ANTHRACENE	120-12-7	NA	4.69E+03	NA	4.06E+03	NA	3.29E+03	NA	2.62E+03	2.62E+03
BENZO(A)ANTHRACENE	56-55-3	1.51E-01	NA	1.31E-01	NA	1.06E-01	NA	8.44E-02	NA	8.44E-02
BENZO(A)PYRENE	50-32-8	1.01E-02	NA	8.78E-03	NA	7.09E-03	NA	5.67E-03	NA	5.67E-03
BENZO(B)FLUORANTHENE	205-99-2	1.01E-01	NA	8.78E-02	NA	7.09E-02	NA	5.67E-02	NA	5.67E-02
BENZO(GHI)PERYLENE	191-24-2	NA	5.94E+01	NA	5.15E+01	NA	4.17E+01	NA	3.32E+01	3.32E+01
BENZO(K)FLUORANTHENE	207-08-9	1.03E+00	NA	8.89E-01	NA	7.18E-01	NA	5.74E-01	NA	5.74E-01
CHRYSENE	218-01-9	1.19E+01	NA	1.03E+01	NA	8.32E+00	NA	6.65E+00	NA	6.65E+00
DIBENZO(A,H)ANTHRACENE	53-70-3	4.73E-03	NA	4.10E-03	NA	3.31E-03	NA	2.64E-03	NA	2.64E-03
FLUORANTHENE	206-44-0	NA	4.03E+02	NA	3.50E+02	NA	2.83E+02	NA	2.26E+02	2.26E+02
FLUORENE	86-73-7	NA	8.07E+02	NA	6.99E+02	NA	5.66E+02	NA	4.51E+02	4.51E+02
INDENO(1,2,3-CD)PYRENE	193-39-5	7.09E-02	NA	6.14E-02	NA	4.96E-02	NA	3.97E-02	NA	3.97E-02
NAPHTHALENE	91-20-3	NA	9.44E+02	NA	8.18E+02	NA	6.62E+02	NA	5.28E+02	5.28E+02
PHENANTHRENE	85-01-8	NA	4.75E+02	NA	4.12E+02	NA	3.33E+02	NA	2.66E+02	2.66E+02
PYRENE	129-00-0	NA	3.31E+02	NA	2.87E+02	NA	2.32E+02	NA	1.85E+02	1.85E+02

TABLE D.2
CALCULATED SITE-SPECIFIC SCREENING LEVELS FOR SURFACE WATER
COKE POINT OFFSHORE AREA

Constituent	CAS No.	Adult Calculated Concentration		Adolescent Calculated Concentration		Child Calculated Concentration		Watermen Calculated Concentration		Selected Screening Level
		Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	Cancer (ug/L)	Non-Cancer (ug/L)	(ug/L)
Volatile Organic Compounds										
1,1,1-TRICHLOROETHANE	71-55-6	NA	3.41E+05	NA	2.96E+05	NA	2.39E+05	NA	1.91E+05	1.91E+05
1,1,2,2-TETRACHLOROETHANE	79-34-5	3.75E+01	1.29E+03	9.75E+01	1.11E+03	1.31E+02	9.02E+02	2.10E+01	7.19E+02	2.10E+01
1,1,2-TRICHLOROETHANE	79-00-5	1.42E+02	1.39E+03	3.69E+02	1.20E+03	4.97E+02	9.72E+02	7.94E+01	7.75E+02	7.94E+01
1,1-DICHLOROETHANE	75-34-3	1.36E+03	6.62E+04	3.52E+03	5.74E+04	4.75E+03	4.64E+04	7.58E+02	3.70E+04	7.58E+02
1,1-DICHLOROETHENE	75-35-4	NA	9.24E+03	NA	8.01E+03	NA	6.48E+03	NA	5.17E+03	5.17E+03
1,2-DICHLOROBENZENE	95-50-1	NA	4.87E+03	NA	4.22E+03	NA	3.41E+03	NA	2.72E+03	2.72E+03
1,2-DICHLOROETHANE	107-06-2	1.35E+02	1.06E+04	3.52E+02	9.15E+03	4.75E+02	7.41E+03	7.57E+01	5.91E+03	7.57E+01
1,2-DICHLOROPROPANE	78-87-5	1.84E+02	2.56E+04	4.79E+02	2.22E+04	6.46E+02	1.79E+04	1.03E+02	1.43E+04	1.03E+02
1,3-DICHLOROBENZENE	541-73-1	NA	3.44E+03	NA	2.98E+03	NA	2.41E+03	NA	1.93E+03	1.93E+03
2-BUTANONE (MEK)	78-93-3	NA	1.39E+06	NA	1.20E+06	NA	9.72E+05	NA	7.75E+05	7.75E+05
2-CHLOROETHYL VINYL ETHER	110-75-8	NA	NA	NA	NA	NA	NA	NA	NA	NA
ACROLEIN	107-02-8	NA	1.71E+03	NA	1.48E+03	NA	1.20E+03	NA	9.54E+02	9.54E+02
ACRYLONITRILE	107-13-1	7.99E+01	7.39E+04	2.08E+02	6.41E+04	2.80E+02	5.18E+04	4.47E+01	4.14E+04	4.47E+01
BENZENE	71-43-2	6.27E+01	5.91E+02	1.63E+02	5.13E+02	2.20E+02	4.15E+02	3.51E+01	3.31E+02	3.51E+01
BROMODICHLOROMETHANE	75-27-4	1.81E+02	9.64E+03	4.72E+02	8.36E+03	6.36E+02	6.76E+03	1.02E+02	5.39E+03	1.02E+02
BROMOFORM	75-25-2	2.98E+03	2.02E+04	7.74E+03	1.75E+04	1.04E+04	1.41E+04	1.67E+03	1.13E+04	1.67E+03
BROMOMETHANE	74-83-9	NA	1.11E+03	NA	9.61E+02	NA	7.78E+02	NA	6.20E+02	6.20E+02
CARBON TETRACHLORIDE	56-23-5	2.49E+01	9.70E+01	6.47E+01	8.41E+01	8.72E+01	6.80E+01	1.39E+01	5.43E+01	1.39E+01
CHLOROBENZENE	108-90-7	NA	1.58E+03	NA	1.37E+03	NA	1.11E+03	NA	8.86E+02	8.86E+02
CHLOROETHANE	75-00-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	67-66-3	2.45E+02	3.26E+03	6.38E+02	2.83E+03	8.61E+02	2.29E+03	1.37E+02	1.82E+03	1.37E+02
CHLOROMETHANE	74-87-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.20E+02	1.55E+04	3.13E+02	1.34E+04	4.22E+02	1.09E+04	6.73E+01	8.66E+03	6.73E+01
DIBROMOCHLOROMETHANE	124-48-1	2.13E+02	1.53E+04	5.54E+02	1.33E+04	7.47E+02	1.08E+04	1.19E+02	8.59E+03	1.19E+02
DICHLORODIFLUOROMETHANE	75-71-8	NA	4.93E+04	NA	4.27E+04	NA	3.46E+04	NA	2.76E+04	2.76E+04
ETHYLBENZENE	100-41-4	9.60E+01	4.53E+03	2.50E+02	3.92E+03	3.37E+02	3.17E+03	5.37E+01	2.53E+03	5.37E+01
METHYLENE CHLORIDE	75-09-2	1.97E+03	3.80E+04	5.13E+03	3.30E+04	6.91E+03	2.67E+04	1.10E+03	2.13E+04	1.10E+03
M-XYLENE & P-XYLENE	136777-61-2	NA	8.37E+03	NA	7.25E+03	NA	5.87E+03	NA	4.68E+03	4.68E+03
O-XYLENE	95-47-6	NA	8.37E+03	NA	7.25E+03	NA	5.87E+03	NA	4.68E+03	4.68E+03
TETRACHLOROETHENE	127-18-4	2.90E+00	6.72E+02	7.55E+00	5.83E+02	1.02E+01	4.71E+02	1.62E+00	3.76E+02	1.62E+00
TOLUENE	108-88-3	NA	5.72E+04	NA	4.96E+04	NA	4.01E+04	NA	3.20E+04	3.20E+04
TRANS-1,2-DICHLOROETHENE	156-60-5	NA	5.76E+03	NA	4.99E+03	NA	4.04E+03	NA	3.22E+03	3.22E+03
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.20E+02	1.55E+04	3.13E+02	1.34E+04	4.22E+02	1.09E+04	6.73E+01	8.66E+03	6.73E+01
TRICHLOROETHENE	79-01-6	7.31E+02	NA	1.90E+03	NA	2.56E+03	NA	4.09E+02	NA	4.09E+02
TRICHLOROFLUOROMETHANE	75-69-4	NA	5.12E+04	NA	4.44E+04	NA	3.59E+04	NA	2.86E+04	2.86E+04
VINYL CHLORIDE	75-01-4	1.28E+01	1.19E+03	1.11E+01	1.03E+03	8.98E+00	8.33E+02	7.18E+00	6.65E+02	7.18E+00
XYLENES (TOTAL)	1330-20-7	NA	8.37E+03	NA	7.25E+03	NA	5.87E+03	NA	4.68E+03	4.68E+03
PCB Congeners										
TOTAL PCBS	TOTPCB_NDDL	9.26E-06	NA	2.41E-05	NA	3.25E-05	NA	5.18E-06	NA	5.18E-06
Dioxin										
Total Dioxin	WHOTEQNDDL	4.91E-07	2.74E-06	1.28E-06	2.37E-06	1.72E-06	1.92E-06	2.75E-07	1.53E-06	2.75E-07
Butyltins										
DIBUTYLTIN	1002-53-5	NA	1.96E+01	NA	1.70E+01	NA	1.37E+01	NA	1.09E+01	1.09E+01
MONOBUTYLTIN	2406-65-7	NA	1.96E+01	NA	1.70E+01	NA	1.37E+01	NA	1.09E+01	1.09E+01
TETRABUTYLTIN	1461-25-2	NA	1.96E+01	NA	1.70E+01	NA	1.37E+01	NA	1.09E+01	1.09E+01
TRIBUTYLTIN	688-73-3	NA	1.96E+01	NA	1.70E+01	NA	1.37E+01	NA	1.09E+01	1.09E+01

TABLE D.3
EXPOSURE PARAMETERS USED IN CALCULATIONS
COKE POINT OFFSHORE AREA

Exposure Parameters	Adult	Youth (6-16)	Child (<6)	Watermen	References	
			Dermal - Sediment			
SSA	3,870	3,870	2,620	3,900	USEPA 1997b	*cm^2*
EF	32	32	32	39	BPJ (1)	*d/year*
ED	30	10	6	30	USEPA 1989	*years*
CF	0.000001	0.000001	0.000001	0.000001	USEPA 1989	*kg/mg*
AF	0.07	0.2	**0.2**	0.2	USEPA 2004	*mg/cm^2-event*
ABS	*chemical specific*				USEPA 2004	
BW	70	45	18	70	USEPA 1997b	*kg*
ATc	25,550	25,550	25,550	25,550	USEPA 1989	*d/yr*
ATnc	10,950	3,650	2,190	10,950	USEPA 1989	*d/yr*
			Dermal - Surface Water			
SA	18,000	13,350	6,600	6,600	USEPA 2004	*cm^2*
ET	2	2	2	8	BPJ (2)	*hours/day*
EF	32	32	32	39	BPJ (2)	*d/year*
ED	30	10	6	30	USEPA 1989	*years*
CF	0.001	0.001	0.001	0.001	USEPA 1989	*L/cm^3*
PC	*chemical specific*				USEPA 2004	*cm/hr*
ATc	25,550	25,550	25,550	25,550	USEPA 1989	*d/yr*
ATnc	10,950	3,650	2,190	10,950	USEPA 1989	*d/yr*
BW	70	45	18	70	USEPA 1997b	*kg*

Based on child as a conservative measure.

(1) Additional description for this exposure parameter can be found on Tables 6.4.5 through 6.4.8.

(2) Additional description for this exposure parameter can be found on Tables 6.4.1 through 6.4.4.

TABLE D.4
CALCULATIONS FOR SITE-SPECIFIC SEDIMENT SCREENING LEVELS
COKE POINT OFFSHORE AREA

Receptor	CANCER			NON-CANCER		
	Ingestion intake variable	Dermal intake variable	Inhalation intake variable	Ingestion intake variable	Dermal intake variable	Inhalation intake variable
Adult	NA	1.45E-07	NA	NA	3.39E-07	NA
Adolescent	NA	2.15E-07	NA	NA	1.51E-06	NA
Child	NA	2.19E-07	NA	NA	2.55E-06	NA
Watermen	NA	5.10E-07	NA	NA	1.19E-06	NA

Acceptable risk = 1.00E-06
Acceptable HI = 0.1

For Non-Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target HI} \times AT_{nc} \times BW]}{[EF \times ED \times (1/RfD_o \times GIABS) \times SA \times AF \times ABS \times CF]}$$

For Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target Risk} \times AT_c \times BW]}{[EF \times ED \times (CSF_o/GIABS) \times SA \times AF \times ABS \times CF]}$$

Constituent	CAS No.	Oral		GI ABS(1)	Dermal		ABS(1)	Mutagen	Cancer				Non-Cancer			
									Dermal				Dermal			
		CSF_o (mg/kg-day)$^{-1}$	RfD_o (mg/kg-day)		CSF_d (mg/kg-day)$^{-1}$	RfD_d (mg/kg-day)			Adult (mg/kg)	Adolescent (mg/kg)	Child (mg/kg)	Watermen (mg/kg)	Adult (mg/kg)	Adolescent (mg/kg)	Child (mg/kg)	Watermen (mg/kg)
Metals																
ALUMINUM	7429-90-5	NA	1.00E+00	1	NA	1.00E+00	0.01		NA	NA	NA	NA	2.95E+07	6.63E+06	3.92E+06	8.40E+06
ANTIMONY	7440-36-0	NA	4.00E-04	0.15	NA	6.00E-05	0.01		NA	NA	NA	NA	1.77E+03	3.98E+02	2.35E+02	5.04E+02
ARSENIC	7440-38-2	1.50E+00	3.00E-04	1	1.50E+00	3.00E-04	0.03		1.53E+02	1.03E+02	1.02E+02	4.36E+01	2.95E+03	6.63E+02	3.92E+02	8.40E+02
BARIUM	7440-39-3	NA	2.00E-01	0.07	NA	1.40E-02	0.01		NA	NA	NA	NA	4.13E+05	9.28E+04	5.49E+04	1.18E+05
BERYLLIUM	7440-41-7	NA	2.00E-03	0.007	NA	1.40E-05	0.01		NA	NA	NA	NA	4.13E+02	9.28E+01	5.49E+01	1.18E+02
CADMIUM	7440-43-9	NA	1.00E-03	0.025	NA	2.50E-05	0.001		NA	NA	NA	NA	7.37E+03	1.66E+03	9.80E+02	2.10E+03
CHROMIUM	7440-47-3	5.00E-01	3.00E-03	0.025	2.00E+01	7.50E-05	0.01	M	3.44E+01	2.32E+01	2.29E+01	9.80E+00	2.21E+03	4.97E+02	2.94E+02	6.30E+02
CHROMIUM, TRIVALENT	16065-83-1	NA	1.50E+00	0.013	NA	1.95E-02	0.01		NA	NA	NA	NA	5.75E+05	1.29E+05	7.64E+04	1.64E+05
COBALT	7440-48-4	NA	3.00E-04	1	NA	3.00E-04	0.01		NA	NA	NA	NA	8.84E+03	1.99E+03	1.18E+03	2.52E+03
COPPER	7440-50-8	NA	4.00E-02	1	NA	4.00E-02	0.01		NA	NA	NA	NA	1.18E+06	2.65E+05	1.57E+05	3.36E+05
CYANIDE	57-12-5	NA	2.00E-02	1	NA	2.00E-02	0.01		NA	NA	NA	NA	5.89E+05	1.33E+05	7.84E+04	1.68E+05
IRON	7439-89-6	NA	7.00E-01	1	NA	7.00E-01	0.01		NA	NA	NA	NA	2.06E+07	4.64E+06	2.74E+06	5.88E+06
LEAD	7439-92-1	NA	NA	1	NA	NA	0.01		NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	7439-96-5	NA	2.40E-02	0.04	NA	9.60E-04	0.01		NA	NA	NA	NA	2.83E+04	6.37E+03	3.76E+03	8.06E+03
MERCURY	7439-97-6	NA	3.00E-04	0.07	NA	2.10E-05	0.01		NA	NA	NA	NA	6.19E+02	1.39E+02	8.23E+01	1.76E+02
NICKEL	7440-02-0	NA	2.00E-02	0.04	NA	8.00E-04	0.01		NA	NA	NA	NA	2.36E+04	5.31E+03	3.13E+03	6.72E+03
SELENIUM	7782-49-2	NA	5.00E-03	1	NA	5.00E-03	0.01		NA	NA	NA	NA	1.47E+05	3.32E+04	1.96E+04	4.20E+04
SILVER	7440-22-4	NA	5.00E-03	0.04	NA	2.00E-04	0.01		NA	NA	NA	NA	5.89E+03	1.33E+03	7.84E+02	1.68E+03
THALLIUM	7440-28-0	NA	NA	1	NA	NA	0.01		NA	NA	NA	NA	NA	NA	NA	NA
TIN	7440-31-5	NA	6.00E-01	1	NA	6.00E-01	0.01		NA	NA	NA	NA	1.77E+07	3.98E+06	2.35E+06	5.04E+06
VANADIUM	7440-62-2	NA	5.00E-03	1	NA	5.00E-03	0.01		NA	NA	NA	NA	1.47E+05	3.32E+04	1.96E+04	4.20E+04
ZINC	7440-66-6	NA	3.00E-01	1	NA	3.00E-01	0.01		NA	NA	NA	NA	8.84E+06	1.99E+06	1.18E+06	2.52E+06
Polycyclic Aromatic Hydrocarbons (PAHs)																
1-METHYLNAPHTHALENE	90-12-0	2.90E-02	7.00E-02	1	2.90E-02	7.00E-02	0.13		1.82E+03	1.23E+03	1.21E+03	5.20E+02	1.59E+05	3.57E+04	2.11E+04	4.52E+04
2-METHYLNAPHTHALENE	91-57-6	NA	4.00E-03	1	NA	4.00E-03	0.13		NA	NA	NA	NA	9.07E+03	2.04E+03	1.21E+03	2.58E+03
ACENAPHTHENE	83-32-9	NA	6.00E-02	1	NA	6.00E-02	0.13		NA	NA	NA	NA	1.36E+05	3.06E+04	1.81E+04	3.88E+04
ACENAPHTHYLENE	208-96-8	NA	6.00E-02	1	NA	6.00E-02	0.13		NA	NA	NA	NA	1.36E+05	3.06E+04	1.81E+04	3.88E+04
ANTHRACENE	120-12-7	NA	3.00E-01	1	NA	3.00E-01	0.13		NA	NA	NA	NA	6.80E+05	1.53E+05	9.04E+04	1.94E+05
BENZO(A)ANTHRACENE	56-55-3	7.30E-01	NA	1	7.30E-01	NA	0.13	M	7.25E+01	1.63E+01	9.61E+00	2.07E+01	NA	NA	NA	NA
BENZO(A)PYRENE	50-32-8	7.30E+00	NA	1	7.30E+00	NA	0.13	M	7.25E+00	1.63E+00	9.61E-01	2.07E+00	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	205-99-2	7.30E-01	NA	1	7.30E-01	NA	0.13	M	7.25E+01	1.63E+01	9.61E+00	2.07E+01	NA	NA	NA	NA
BENZO(GHI)PERYLENE	191-24-2	NA	3.00E-02	1	NA	3.00E-02	0.13		NA	NA	NA	NA	6.80E+04	1.53E+04	9.04E+03	1.94E+04
BENZO(K)FLUORANTHENE	207-08-9	7.30E-02	NA	1	7.30E-02	NA	0.13	M	7.25E+02	1.63E+02	9.61E+01	2.07E+02	NA	NA	NA	NA
CHRYSENE	218-01-9	7.30E-03	NA	1	7.30E-03	NA	0.13	M	7.25E+03	1.63E+03	9.61E+02	2.07E+03	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	53-70-3	7.30E+00	NA	1	7.30E+00	NA	0.13	M	7.25E+00	1.63E+00	9.61E-01	2.07E+00	NA	NA	NA	NA
FLUORANTHENE	206-44-0	NA	4.00E-02	1	NA	4.00E-02	0.13		NA	NA	NA	NA	9.07E+04	2.04E+04	1.21E+04	2.58E+04
FLUORENE	86-73-7	NA	4.00E-02	1	NA	4.00E-02	0.13		NA	NA	NA	NA	9.07E+04	2.04E+04	1.21E+04	2.58E+04
INDENO(1,2,3-CD)PYRENE	193-39-5	7.30E-01	NA	1	7.30E-01	NA	0.13	M	7.25E+01	1.63E+01	9.61E+00	2.07E+01	NA	NA	NA	NA
NAPHTHALENE	91-20-3	NA	2.00E-02	1	NA	2.00E-02	0.13		NA	NA	NA	NA	4.53E+04	1.02E+04	6.03E+03	1.29E+04
PHENANTHRENE	85-01-8	NA	3.00E-02	1	NA	3.00E-02	0.13		NA	NA	NA	NA	6.80E+04	1.53E+04	9.04E+03	1.94E+04
PYRENE	129-00-0	NA	3.00E-02	1	NA	3.00E-02	0.13		NA	NA	NA	NA	6.80E+04	1.53E+04	9.04E+03	1.94E+04

TABLE D.4
CALCULATIONS FOR SITE-SPECIFIC SEDIMENT SCREENING LEVELS
COKE POINT OFFSHORE AREA

Receptor	CANCER			NON-CANCER		
	Ingestion intake variable	Dermal intake variable	Inhalation intake variable	Ingestion intake variable	Dermal intake variable	Inhalation intake variable
Adult	NA	1.45E-07	NA	NA	3.39E-07	NA
Adolescent	NA	2.15E-07	NA	NA	1.51E-06	NA
Child	NA	2.19E-07	NA	NA	2.55E-06	NA
Watermen	NA	5.10E-07	NA	NA	1.19E-06	NA

Acceptable risk = 1.00E-06
Acceptable HI = 0.1

For Non-Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target HI} \times AT_{nc} \times BW]}{[EF \times ED \times (1/RfD_o \times GIABS) \times SA \times AF \times ABS \times CF]}$$

For Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target Risk} \times AT_c \times BW]}{[EF \times ED \times (CSF_o/GIABS) \times SA \times AF \times ABS \times CF]}$$

Constituent	CAS No.	Oral		GI ABS(1)	Dermal		ABS(1)	Mutagen	Cancer				Non-Cancer			
									Dermal				Dermal			
		CSF_o (mg/kg-day)$^{-1}$	RfD_o (mg/kg-day)		CSF_d (mg/kg-day)$^{-1}$	RfD_d (mg/kg-day)			Adult (mg/kg)	Adolescent (mg/kg)	Child (mg/kg)	Watermen (mg/kg)	Adult (mg/kg)	Adolescent (mg/kg)	Child (mg/kg)	Watermen (mg/kg)
Volatile Organic Compounds																
1,1,1-TRICHLOROETHANE	71-55-6	NA	2.00E+00	1	NA	2.00E+00	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-TETRACHLOROETHANE	79-34-5	2.00E-01	4.00E-03	1	2.00E-01	4.00E-03	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-TRICHLOROETHANE	79-00-5	5.70E-02	4.00E-03	1	5.70E-02	4.00E-03	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,1-DICHLOROETHANE	75-34-3	5.70E-03	2.00E-01	1	5.70E-03	2.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,1-DICHLOROETHENE	75-35-4	NA	5.00E-02	1	NA	5.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROBENZENE	95-50-1	NA	9.00E-02	1	NA	9.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROETHANE	107-06-2	9.10E-02	2.00E-02	1	9.10E-02	2.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,2-DICHLOROPROPANE	78-87-5	3.60E-02	9.00E-02	1	3.60E-02	9.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
1,3-DICHLOROBENZENE	541-73-1	NA	9.00E-02	1	NA	9.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
2-BUTANONE (MEK)	78-93-3	NA	6.00E-01	1	NA	6.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
2-CHLOROETHYL VINYL ETHER	110-75-8			1	0.00E+00	0.00E+00	NA		NA	NA	NA	NA	NA	NA	NA	NA
ACROLEIN	107-02-8	NA	5.00E-04	1	NA	5.00E-04	NA		NA	NA	NA	NA	NA	NA	NA	NA
ACRYLONITRILE	107-13-1	5.40E-01	4.00E-02	1	5.40E-01	4.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
BENZENE	71-43-2	5.50E-02	4.00E-03	1	5.50E-02	4.00E-03	0.0005		2.50E+05	1.69E+05	1.66E+05	7.13E+04	2.36E+06	5.31E+05	3.13E+05	6.72E+05
BROMODICHLOROMETHANE	75-27-4	6.20E-02	2.00E-02	1	6.20E-02	2.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
BROMOFORM	75-25-2	7.90E-03	2.00E-02	1	7.90E-03	2.00E-02	0.1		8.71E+03	5.88E+03	5.79E+03	2.48E+03	5.89E+04	1.33E+04	7.84E+03	1.68E+04
BROMOMETHANE	74-83-9	NA	1.40E-03	1	NA	1.40E-03	NA		NA	NA	NA	NA	NA	NA	NA	NA
CARBON TETRACHLORIDE	56-23-5	1.30E-01	7.00E-04	1	1.30E-01	7.00E-04	NA		NA	NA	NA	NA	NA	NA	NA	NA
CHLOROBENZENE	108-90-7	NA	2.00E-02	1	NA	2.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
CHLOROETHANE	75-00-3	NA	NA	1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	67-66-3	3.10E-02	1.00E-02	1	3.10E-02	1.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	74-87-3	NA	NA	1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00E-01	3.00E-02	1	1.00E-01	3.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
DIBROMOCHLOROMETHANE	124-48-1	8.40E-02	2.00E-02	1	8.40E-02	2.00E-02	0.1		8.19E+02	5.53E+02	5.44E+02	2.33E+02	5.89E+04	1.33E+04	7.84E+03	1.68E+04
DICHLORODIFLUOROMETHANE	75-71-8	NA	2.00E-01	1	NA	2.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	1.10E-02	1.00E-01	1	1.10E-02	1.00E-01	0.03		2.08E+04	1.41E+04	1.39E+04	5.94E+03	9.82E+05	2.21E+05	1.31E+05	2.80E+05
METHYLENE CHLORIDE	75-09-2	7.50E-03	6.00E-02	1	7.50E-03	6.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
M-XYLENE & P-XYLENE	136777-61-2	NA	2.00E-01	1	NA	2.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
O-XYLENE	95-47-6	NA	2.00E-01	1	NA	2.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
TETRACHLOROETHENE	127-18-4	5.40E-01	1.00E-02	1	5.40E-01	1.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
TOLUENE	108-88-3	NA	8.00E-01	1	NA	8.00E-01	0.03		NA	NA	NA	NA	7.86E+06	1.77E+06	1.04E+06	2.24E+06
TRANS-1,2-DICHLOROETHENE	156-60-5	NA	2.00E-02	1	NA	2.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00E-01	3.00E-02	1	1.00E-01	3.00E-02	NA		NA	NA	NA	NA	NA	NA	NA	NA
TRICHLOROETHENE	79-01-6	5.90E-03	NA	1	5.90E-03	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA
TRICHLOROFLUOROMETHANE	75-69-4	NA	3.00E-01	1	NA	3.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
VINYL CHLORIDE	75-01-4	7.20E-01	3.00E-03	1	7.20E-01	3.00E-03	NA	M	NA	NA	NA	NA	NA	NA	NA	NA
XYLENES (TOTAL)	1330-20-7	NA	2.00E-01	1	NA	2.00E-01	NA		NA	NA	NA	NA	NA	NA	NA	NA
PCB Congeners																
TOTAL PCBS	TOTPCB_NDDL	1.30E+04	NA	1	1.30E+04	NA	0.14		3.78E-03	2.55E-03	2.51E-03	1.08E-03	NA	NA	NA	NA
Dioxin																
Total Dioxin	WHOTEQNDDL	1.30E+05	1.00E-09	1	1.30E+05	1.00E-09	0.03		1.76E-03	1.19E-03	1.17E-03	5.03E-04	9.82E-03	2.21E-03	1.31E-03	2.80E-03
Butyltins																
DIBUTYLTIN	1002-53-5	NA	3.00E-04	1	NA	3.00E-04	0.1		NA	NA	NA	NA	8.84E+02	1.99E+02	1.18E+02	2.52E+02
MONOBUTYLTIN	2406-65-7	NA	3.00E-04	1	NA	3.00E-04	0.1		NA	NA	NA	NA	8.84E+02	1.99E+02	1.18E+02	2.52E+02
TETRABUTYLTIN	1461-25-2	NA	3.00E-04	1	NA	3.00E-04	0.1		NA	NA	NA	NA	8.84E+02	1.99E+02	1.18E+02	2.52E+02
TRIBUTYLTIN	688-73-3	NA	3.00E-04	1	NA	3.00E-04	0.1		NA	NA	NA	NA	8.84E+02	1.99E+02	1.18E+02	2.52E+02

(1) Taken from U.S. EPA 2004, *Risk Assessment guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* , Final. OSWER 9285.7-02EP and U.S. EPA 2003, Region 3, *Updated Dermal Exposure Assessment Guidance* , June.

TABLE D.5
CALCULATIONS FOR SITE-SPECIFIC SURFACE WATER SCREENING LEVELS
COKE POINT OFFSHORE AREA

Receptor	CANCER			NON-CANCER		
	Ingestion intake variable	Dermal intake variable	Inhalation intake variable	Ingestion intake variable	Dermal intake variable	Inhalation intake variable
Adult	NA	5.18E+04	NA	NA	2.22E+04	NA
Adolescent	NA	1.35E+05	NA	NA	1.92E+04	NA
Child	NA	1.81E+05	NA	NA	1.56E+04	NA
Watermen	NA	2.90E+04	NA	NA	1.24E+04	NA

Acceptable risk = 1.00E-06
Acceptable HI = 0.1

For Non-Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target HI} \times AT_{nc} \times BW]}{[EF \times ED \times (1/RfD_o \times GIABS) \times SA \times PC \times ET \times CF]}$$

For Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target Risk} \times AT_c \times BW]}{[EF \times ED \times (CSF_o/GIABS) \times SA \times PC \times ET \times CF]}$$

Constituent	CAS No.	Oral		GI ABS(1)	Dermal		PC(2) (cm/hr)	Mutagen	Cancer				Non-Cancer			
									Dermal				Dermal			
		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)			Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)	Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)
Metals																
ALUMINUM	7429-90-5	NA	1.00E+00	1	NA	1.00E+00	1.00E-03		NA	NA	NA	NA	2.22E+06	1.92E+06	1.56E+06	1.24E+06
ANTIMONY	7440-36-0	NA	4.00E-04	0.15	NA	6.00E-05	1.00E-03		NA	NA	NA	NA	1.33E+02	1.15E+02	9.33E+01	7.44E+01
ARSENIC	7440-38-2	1.50E+00	3.00E-04	1	1.50E+00	3.00E-04	1.00E-03		3.45E+01	8.97E+01	1.21E+02	1.93E+01	6.65E+02	5.77E+02	4.67E+02	3.72E+02
BARIUM	7440-39-3	NA	2.00E-01	0.07	NA	1.40E-02	1.00E-03		NA	NA	NA	NA	3.11E+04	2.69E+04	2.18E+04	1.74E+04
BERYLLIUM	7440-41-7	NA	2.00E-03	0.007	NA	1.40E-05	1.00E-03		NA	NA	NA	NA	3.11E+01	2.69E+01	2.18E+01	1.74E+01
CADMIUM	7440-43-9	NA	1.00E-03	0.025	NA	2.50E-05	1.00E-03		NA	NA	NA	NA	5.54E+01	4.81E+01	3.89E+01	3.10E+01
CHROMIUM	7440-47-3	NA	1.50E+00	0.025	NA	3.75E-02	2.00E-03	M	NA	NA	NA	NA	4.16E+04	3.60E+04	2.92E+04	2.33E+04
CHROMIUM, TRIVALENT	16065-83-1	NA	1.50E+00	0.013	NA	1.95E-02	1.00E-03		NA	NA	NA	NA	4.32E+04	3.75E+04	3.03E+04	2.42E+04
COBALT	7440-48-4	NA	3.00E-04	1	NA	3.00E-04	4.00E-04		NA	NA	NA	NA	1.66E+03	1.44E+03	1.17E+03	9.31E+02
COPPER	7440-50-8	NA	4.00E-02	1	NA	4.00E-02	1.00E-03		NA	NA	NA	NA	8.87E+04	7.69E+04	6.22E+04	4.96E+04
CYANIDE	57-12-5	NA	2.00E-02	1	NA	2.00E-02	1.00E-03		NA	NA	NA	NA	4.44E+04	3.84E+04	3.11E+04	2.48E+04
IRON	7439-89-6	NA	7.00E-01	1	NA	7.00E-01	1.00E-03		NA	NA	NA	NA	1.55E+06	1.35E+06	1.09E+06	8.69E+05
LEAD	7439-92-1	NA	NA	1	NA	NA	1.00E-03		NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	7439-96-5	NA	2.40E-02	0.04	NA	9.60E-04	1.00E-03		NA	NA	NA	NA	2.13E+03	1.85E+03	1.49E+03	1.19E+03
MERCURY	7439-97-6	NA	3.00E-04	0.07	NA	2.10E-05	1.00E-03		NA	NA	NA	NA	4.66E+01	4.04E+01	3.27E+01	2.61E+01
NICKEL	7440-02-0	NA	2.00E-02	0.04	NA	8.00E-04	2.00E-04		NA	NA	NA	NA	8.87E+03	7.69E+03	6.22E+03	4.96E+03
SELENIUM	7782-49-2	NA	5.00E-03	1	NA	5.00E-03	1.00E-03		NA	NA	NA	NA	1.11E+04	9.61E+03	7.78E+03	6.20E+03
SILVER	7440-22-4	NA	5.00E-03	0.04	NA	2.00E-04	6.00E-04		NA	NA	NA	NA	7.39E+02	6.41E+02	5.18E+02	4.14E+02
THALLIUM	7440-28-0	NA	NA	1	NA	NA	1.00E-03		NA	NA	NA	NA	NA	NA	NA	NA
TIN	7440-31-5	NA	6.00E-01	1	NA	6.00E-01	1.00E-03		NA	NA	NA	NA	1.33E+06	1.15E+06	9.33E+05	7.44E+05
VANADIUM	7440-62-2	NA	5.00E-03	1	NA	5.00E-03	1.00E-03		NA	NA	NA	NA	1.11E+04	9.61E+03	7.78E+03	6.20E+03
ZINC	7440-66-6	NA	3.00E-01	1	NA	3.00E-01	6.00E-04		NA	NA	NA	NA	1.11E+06	9.61E+05	7.78E+05	6.20E+05
Polycyclic Aromatic Hydrocarbons (PAHs)																
1-METHYLNAPHTHALENE	90-12-0	2.90E-02	7.00E-02	1	2.90E-02	7.00E-02	9.31E-02		1.92E+01	4.98E+01	6.72E+01	1.07E+01	1.67E+03	1.45E+03	1.17E+03	9.33E+02
2-METHYLNAPHTHALENE	91-57-6	NA	4.00E-03	1	NA	4.00E-03	9.17E-02		NA	NA	NA	NA	9.67E+01	8.39E+01	6.78E+01	5.41E+01
ACENAPHTHENE	83-32-9	NA	6.00E-02	1	NA	6.00E-02	8.60E-02		NA	NA	NA	NA	1.55E+03	1.34E+03	1.09E+03	8.66E+02
ACENAPHTHYLENE	208-96-8	NA	6.00E-02	1	NA	6.00E-02	9.11E-02		NA	NA	NA	NA	1.46E+03	1.27E+03	1.02E+03	8.17E+02
ANTHRACENE	120-12-7	NA	3.00E-01	1	NA	3.00E-01	1.42E-01		NA	NA	NA	NA	4.69E+03	4.06E+03	3.29E+03	2.62E+03
BENZO(A)ANTHRACENE	56-55-3	7.30E-01	NA	1	7.30E-01	NA	4.70E-01	M	1.51E-01	1.31E-01	1.06E-01	8.44E-02	NA	NA	NA	NA
BENZO(A)PYRENE	50-32-8	7.30E+00	NA	1	7.30E+00	NA	7.00E-01	M	1.01E-02	8.78E-03	7.09E-03	5.67E-03	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	205-99-2	7.30E-01	NA	1	7.30E-01	NA	7.00E-01	M	1.01E-01	8.78E-02	7.09E-02	5.67E-02	NA	NA	NA	NA
BENZO(GHI)PERYLENE	191-24-2	NA	3.00E-02	1	NA	3.00E-02	1.12E+00		NA	NA	NA	NA	5.94E+01	5.15E+01	4.17E+01	3.32E+01
BENZO(K)FLUORANTHENE	207-08-9	7.30E-02	NA	1	7.30E-02	NA	6.91E-01	M	1.03E+00	8.89E-01	7.18E-01	5.74E-01	NA	NA	NA	NA
CHRYSENE	218-01-9	7.30E-03	NA	1	7.30E-03	NA	5.96E-01	M	1.19E+01	1.03E+01	8.32E+00	6.65E+00	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	53-70-3	7.30E+00	NA	1	7.30E+00	NA	1.50E+00	M	4.73E-03	4.10E-03	3.31E-03	2.64E-03	NA	NA	NA	NA
FLUORANTHENE	206-44-0	NA	4.00E-02	1	NA	4.00E-02	2.20E-01		NA	NA	NA	NA	4.03E+02	3.50E+02	2.83E+02	2.26E+02
FLUORENE	86-73-7	NA	4.00E-02	1	NA	4.00E-02	1.10E-01		NA	NA	NA	NA	8.07E+02	6.99E+02	5.66E+02	4.51E+02
INDENO(1,2,3-CD)PYRENE	193-39-5	7.30E-01	NA	1	7.30E-01	NA	1.00E+00	M	7.09E-02	6.14E-02	4.96E-02	3.97E-02	NA	NA	NA	NA
NAPHTHALENE	91-20-3	NA	2.00E-02	1	NA	2.00E-02	4.70E-02		NA	NA	NA	NA	9.44E+02	8.18E+02	6.62E+02	5.28E+02
PHENANTHRENE	85-01-8	NA	3.00E-02	1	NA	3.00E-02	1.40E-01		NA	NA	NA	NA	4.75E+02	4.12E+02	3.33E+02	2.66E+02
PYRENE	129-00-0	NA	3.00E-02	1	NA	3.00E-02	2.01E-01		NA	NA	NA	NA	3.31E+02	2.87E+02	2.32E+02	1.85E+02

TABLE D.5
CALCULATIONS FOR SITE-SPECIFIC SURFACE WATER SCREENING LEVELS
COKE POINT OFFSHORE AREA

Receptor	CANCER			NON-CANCER		
	Ingestion intake variable	Dermal intake variable	Inhalation intake variable	Ingestion intake variable	Dermal intake variable	Inhalation intake variable
Adult	NA	5.18E+04	NA	NA	2.22E+04	NA
Adolescent	NA	1.35E+05	NA	NA	1.92E+04	NA
Child	NA	1.81E+05	NA	NA	1.56E+04	NA
Watermen	NA	2.90E+04	NA	NA	1.24E+04	NA

Acceptable risk = 1.00E-06
Acceptable HI = 0.1

For Non-Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target HI} \times AT_{nc} \times BW]}{[EF \times ED \times (1/RfD_o \times GIABS) \times SA \times PC \times ET \times CF]}$$

For Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target Risk} \times AT_c \times BW]}{[EF \times ED \times (CSF_o/GIABS) \times SA \times PC \times ET \times CF]}$$

Constituent	CAS No.	Oral		GI ABS(1)	Dermal		PC(2)	Mutagen	Cancer				Non-Cancer			
									Dermal				Dermal			
		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)	(cm/hr)		Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)	Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)
Volatile Organic Compounds																
1,1,1-TRICHLOROETHANE	71-55-6	NA	2.00E+00	1	NA	2.00E+00	1.30E-02		NA	NA	NA	NA	3.41E+05	2.96E+05	2.39E+05	1.91E+05
1,1,2,2-TETRACHLOROETHANE	79-34-5	2.00E-01	4.00E-03	1	2.00E-01	4.00E-03	6.90E-03		3.75E+01	9.75E+01	1.31E+02	2.10E+01	1.29E+03	1.11E+03	9.02E+02	7.19E+02
1,1,2-TRICHLOROETHANE	79-00-5	5.70E-02	4.00E-03	1	5.70E-02	4.00E-03	6.40E-03		1.42E+02	3.69E+02	4.97E+02	7.94E+01	1.39E+03	1.20E+03	9.72E+02	7.75E+02
1,1-DICHLOROETHANE	75-34-3	5.70E-03	2.00E-01	1	5.70E-03	2.00E-01	6.70E-03		1.36E+03	3.52E+03	4.75E+03	7.58E+02	6.62E+04	5.74E+04	4.64E+04	3.70E+04
1,1-DICHLOROETHENE	75-35-4	NA	5.00E-02	1	NA	5.00E-02	1.20E-02		NA	NA	NA	NA	9.24E+03	8.01E+03	6.48E+03	5.17E+03
1,2-DICHLOROBENZENE	95-50-1	NA	9.00E-02	1	NA	9.00E-02	4.10E-02		NA	NA	NA	NA	4.87E+03	4.22E+03	3.41E+03	2.72E+03
1,2-DICHLOROETHANE	107-06-2	9.10E-02	2.00E-02	1	9.10E-02	2.00E-02	4.20E-03		1.35E+02	3.52E+02	4.75E+02	7.57E+01	1.06E+04	9.15E+03	7.41E+03	5.91E+03
1,2-DICHLOROPROPANE	78-87-5	3.60E-02	9.00E-02	1	3.60E-02	9.00E-02	7.80E-03		1.84E+02	4.79E+02	6.46E+02	1.03E+02	2.56E+04	2.22E+04	1.79E+04	1.43E+04
1,3-DICHLOROBENZENE	541-73-1	NA	9.00E-02	1	NA	9.00E-02	5.80E-02		NA	NA	NA	NA	3.44E+03	2.98E+03	2.41E+03	1.93E+03
2-BUTANONE (MEK)	78-93-3	NA	6.00E-01	1	NA	6.00E-01	9.60E-04		NA	NA	NA	NA	1.39E+06	1.20E+06	9.72E+05	7.75E+05
2-CHLOROETHYL VINYL ETHER	110-75-8			1	0.00E+00	0.00E+00	NA		NA	NA	NA	NA	NA	NA	NA	NA
ACROLEIN	107-02-8	NA	5.00E-04	1	NA	5.00E-04	6.50E-04		NA	NA	NA	NA	1.71E+03	1.48E+03	1.20E+03	9.54E+02
ACRYLONITRILE	107-13-1	5.40E-01	4.00E-02	1	5.40E-01	4.00E-02	1.20E-03		7.99E+01	2.08E+02	2.80E+02	4.47E+01	7.39E+04	6.41E+04	5.18E+04	4.14E+04
BENZENE	71-43-2	5.50E-02	4.00E-03	1	5.50E-02	4.00E-03	1.50E-02		6.27E+01	1.63E+02	2.20E+02	3.51E+01	5.91E+02	5.13E+02	4.15E+02	3.31E+02
BROMODICHLOROMETHANE	75-27-4	6.20E-02	2.00E-02	1	6.20E-02	2.00E-02	4.60E-03		1.81E+02	4.72E+02	6.36E+02	1.02E+02	9.64E+03	8.36E+03	6.76E+03	5.39E+03
BROMOFORM	75-25-2	7.90E-03	2.00E-02	1	7.90E-03	2.00E-02	2.20E-03		2.98E+03	7.74E+03	1.04E+04	1.67E+03	2.02E+04	1.75E+04	1.41E+04	1.13E+04
BROMOMETHANE	74-83-9	NA	1.40E-03	1	NA	1.40E-03	2.80E-03		NA	NA	NA	NA	1.11E+03	9.61E+02	7.78E+02	6.20E+02
CARBON TETRACHLORIDE	56-23-5	1.30E-01	7.00E-04	1	1.30E-01	7.00E-04	1.60E-02		2.49E+01	6.47E+01	8.72E+01	1.39E+01	9.70E+01	8.41E+01	6.80E+01	5.43E+01
CHLOROBENZENE	108-90-7	NA	2.00E-02	1	NA	2.00E-02	2.80E-02		NA	NA	NA	NA	1.58E+03	1.37E+03	1.11E+03	8.86E+02
CHLOROETHANE	75-00-3	NA	NA	1	NA	NA	6.10E-03		NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	67-66-3	3.10E-02	1.00E-02	1	3.10E-02	1.00E-02	6.80E-03		2.45E+02	6.38E+02	8.61E+02	1.37E+02	3.26E+03	2.83E+03	2.29E+03	1.82E+03
CHLOROMETHANE	74-87-3	NA	NA	1	NA	NA	3.30E-03		NA	NA	NA	NA	NA	NA	NA	NA
CIS-1,3-DICHLOROPROPENE	10061-01-5	1.00E-01	3.00E-02	1	1.00E-01	3.00E-02	4.30E-03		1.20E+02	3.13E+02	4.22E+02	6.73E+01	1.55E+04	1.34E+04	1.09E+04	8.66E+03
DIBROMOCHLOROMETHANE	124-48-1	8.40E-02	2.00E-02	1	8.40E-02	2.00E-02	2.89E-03		2.13E+02	5.54E+02	7.47E+02	1.19E+02	1.53E+04	1.33E+04	1.08E+04	8.59E+03
DICHLORODIFLUOROMETHANE	75-71-8	NA	2.00E-01	1	NA	2.00E-01	9.00E-03		NA	NA	NA	NA	4.93E+04	4.27E+04	3.46E+04	2.76E+04
ETHYLBENZENE	100-41-4	1.10E-02	1.00E-01	1	1.10E-02	1.00E-01	4.90E-02		9.60E+01	2.50E+02	3.37E+02	5.37E+01	4.53E+03	3.92E+03	3.17E+03	2.53E+03
METHYLENE CHLORIDE	75-09-2	7.50E-03	6.00E-02	1	7.50E-03	6.00E-02	3.50E-03		1.97E+03	5.13E+03	6.91E+03	1.10E+03	3.80E+04	3.30E+04	2.67E+04	2.13E+04
M-XYLENE & P-XYLENE	136777-61-2	NA	2.00E-01	1	NA	2.00E-01	5.30E-02		NA	NA	NA	NA	8.37E+03	7.25E+03	5.87E+03	4.68E+03
O-XYLENE	95-47-6	NA	2.00E-01	1	NA	2.00E-01	5.30E-02		NA	NA	NA	NA	8.37E+03	7.25E+03	5.87E+03	4.68E+03
TETRACHLOROETHENE	127-18-4	5.40E-01	1.00E-02	1	5.40E-01	1.00E-02	3.30E-02		2.90E+00	7.55E+00	1.02E+01	1.62E+00	6.72E+02	5.83E+02	4.71E+02	3.76E+02
TOLUENE	108-88-3	NA	8.00E-01	1	NA	8.00E-01	3.10E-02		NA	NA	NA	NA	5.72E+04	4.96E+04	4.01E+04	3.20E+04
TRANS-1,2-DICHLOROETHENE	156-60-5	NA	2.00E-02	1	NA	2.00E-02	7.70E-03		NA	NA	NA	NA	5.76E+03	4.99E+03	4.04E+03	3.22E+03
TRANS-1,3-DICHLOROPROPENE	10061-02-6	1.00E-01	3.00E-02	1	1.00E-01	3.00E-02	4.30E-03		1.20E+02	3.13E+02	4.22E+02	6.73E+01	1.55E+04	1.34E+04	1.09E+04	8.66E+03
TRICHLOROETHENE	79-01-6	5.90E-03	NA	1	5.90E-03	NA	1.20E-02		7.31E+02	1.90E+03	2.56E+03	4.09E+02	NA	NA	NA	NA
TRICHLOROFLUOROMETHANE	75-69-4	NA	3.00E-01	1	NA	3.00E-01	1.30E-02		NA	NA	NA	NA	5.12E+04	4.44E+04	3.59E+04	2.86E+04
VINYL CHLORIDE	75-01-4	7.20E-01	3.00E-03	1	7.20E-01	3.00E-03	5.60E-03	M	1.28E+01	1.11E+01	8.98E+00	7.18E+00	1.19E+03	1.03E+03	8.33E+02	6.65E+02
XYLENES (TOTAL)	1330-20-7	NA	2.00E-01	1	NA	2.00E-01	5.30E-02		NA	NA	NA	NA	8.37E+03	7.25E+03	5.87E+03	4.68E+03
PCB Congeners																
TOTAL PCBS	TOTPCB	1.30E+04	NA	1	1.30E+04	NA	4.30E-01		9.26E-06	2.41E-05	3.25E-05	5.18E-06	NA	NA	NA	NA
Dioxin																
Total Dioxin	TOTTEF	1.30E+05	1.00E-09	1	1.30E+05	1.00E-09	8.10E-01		4.91E-07	1.28E-06	1.72E-06	2.75E-07	2.74E-06	2.37E-06	1.92E-06	1.53E-06

TABLE D.5
CALCULATIONS FOR SITE-SPECIFIC SURFACE WATER SCREENING LEVELS
COKE POINT OFFSHORE AREA

Receptor	CANCER			NON-CANCER		
	Ingestion intake variable	Dermal intake variable	Inhalation intake variable	Ingestion intake variable	Dermal intake variable	Inhalation intake variable
Adult	NA	5.18E+04	NA	NA	2.22E+04	NA
Adolescent	NA	1.35E+05	NA	NA	1.92E+04	NA
Child	NA	1.81E+05	NA	NA	1.56E+04	NA
Watermen	NA	2.90E+04	NA	NA	1.24E+04	NA

Acceptable risk = 1.00E-06
Acceptable HI = 0.1

For Non-Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target HI x } AT_{nc} \text{ x BW}]}{[\text{EF x ED x } (1/RfD_o \text{ x GIABS}) \text{ x SA x PC x ET x CF}]}$$

For Cancer

$$\text{Screening Level (mg/kg)} = \frac{[\text{Target Risk x } AT_c \text{ x BW}]}{[\text{EF x ED x } (CSF_o/\text{GIABS}) \text{ x SA x PC x ET x CF}]}$$

Constituent	CAS No.	Oral		GI ABS(1)	Dermal		PC(2)	Mutagen	Cancer				Non-Cancer			
									Dermal				Dermal			
		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)		Slope Factor (mg/kg-day)$^{-1}$	RfD (mg/kg-day)	(cm/hr)		Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)	Adult (ug/L)	Adolescent (ug/L)	Child (ug/L)	Watermen (ug/L)
Butyltins																
DIBUTYLTIN	1002-53-5	NA	3.00E-04	1	NA	3.00E-04	3.40E-02		NA	NA	NA	NA	1.96E+01	1.70E+01	1.37E+01	1.09E+01
MONOBUTYLTIN	2406-65-7	NA	3.00E-04	1	NA	3.00E-04	3.40E-02		NA	NA	NA	NA	1.96E+01	1.70E+01	1.37E+01	1.09E+01
TETRABUTYLTIN	1461-25-2	NA	3.00E-04	1	NA	3.00E-04	3.40E-02		NA	NA	NA	NA	1.96E+01	1.70E+01	1.37E+01	1.09E+01
TRIBUTYLTIN	688-73-3	NA	3.00E-04	1	NA	3.00E-04	3.40E-02		NA	NA	NA	NA	1.96E+01	1.70E+01	1.37E+01	1.09E+01

(1) Taken from U.S. EPA 2004, *Risk Assessment guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* , Final. OSWER 9285.7-02EP.

(2) Taken from U.S. EPA 2004, *Risk Assessment guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* , Final. OSWER 9285.7-02EP. If value not available in U.S. EPA 2004, value taken from U.S. DOE 2010, *Risk Assessment Information System* , available at: http://rais.ornl.gov.

APPENDIX E:

COKE POINT TOXICITY PROFILES

ARSENIC

Arsenic (As, MW 74.9, CAS registry number 7440-38-2) is an ubiquitous metalloid present in the environment from natural and anthropogenic sources. Arsenic is a natural component of the earth's crust. It originates from natural sources such as volcanoes and erosion from mineral deposits, but also from human activities such as chemical production and use, coal combustion, and waste disposal. Arsenic can exist in several different valence states and in many different inorganic and organic forms. The form of arsenic with the greatest commercial importance is inorganic arsenic trioxide (As_2O_3), which is produced from flue dust collected during the smelting of copper and lead. There has been no commercial production of As_2O_3 in the United States since 1985, although it is imported for industrial use.

Arsenic is one of the most widely studied toxicants. Analysis of the toxic effects of arsenic is complicated by the fact that arsenic can exist in several different inorganic and organic compounds. Most cases of human toxicity have been associated with exposure to inorganic arsenic (ATSDR 2007). While As_2O_3 is the most common inorganic arsenical in air, a variety of inorganic trivalent arsenites or pentavalent arsenates occur in water, soil, and food (ATSDR 2007). Trivalent arsenites are somewhat more toxic than pentavalent arsenates (USEPA 2010); however, the difference in relative potency is small. An additional complexity in the analysis of arsenic toxicity is that there are no suitable animal models for carcinogenicity.

Carcinogenicity

USEPA has classified arsenic as a human carcinogen (Category A), based on observations of increased lung cancer mortality in populations exposed mainly via inhalation and observations of increased skin cancer incidence and increased mortality from multiple internal organ cancers in populations consuming drinking water containing high concentrations of arsenic (USEPA 2010).

Evidence from a large number of occupational epidemiologic studies indicates that high-dose inhalation exposure to inorganic arsenic is associated with an increase in lung cancer. Most studies involve workers exposed primarily to arsenic trioxide dust in air at copper smelters (e.g., Enterline et al.1987; Enterline and Marsh 1982; Axelson et al.1978), but increased incidence of lung cancer has also been observed at chemical plants where exposure was primarily to arsenate (Ott et al.1974; Sobel et al.1988). Although several studies suggest that residents living near smelters or arsenical chemicals may also have increased risk of lung cancer (Pershagen 1985; Brown et al.1984), the increases are small and may not be biologically significant (e.g., Frost et al.1987).

Several human studies provide sufficient exposure data to permit quantification of cancer risk (Tseng et al.1968; Tseng 1977). In general, the data indicate that there is an approximately linear increase in relative risk as a function of increasing cumulative exposure (USEPA 2010). Animal studies do not show evidence of a carcinogenic effect from inhalation exposure of arsenic (USEPA 2010); however, two intratracheal instillation studies in hamsters have demonstrated that both arsenite and arsenate can increase the incidence of lung adenomas and/or carcinomas (Ishinishi et al.1983; Pershagen and Bjorklund 1985).

One of the most reliable epidemiological studies that provide dose-response data is the investigation by Tseng et al. (1968). In this study, the quantitative risk of skin cancer from exposure to inorganic arsenic by ingestion was examined. In this investigation, 40,421 people in Taiwan were exposed to arsenic in drinking water at levels ranging from 100 to 1,800 ug/L. The control population consisted of 7,500 people who were exposed to undetectable levels up to 17 ug/L arsenic in drinking water. Results showed an age- and dose-dependent increase in the incidence of skin cancer in the exposed population, while there were no arsenic-related skin cancers detected in the control population. USEPA used this study to calculate a unit risk of $5x10^{-5}$ based on lifetime exposure to water containing 1 ug/L arsenic.

Mutagenicity

Arsenic has been tested in a range of prokaryotic and eukaryotic systems. In general, arsenic is either inactive or extremely weak as an inducer of gene mutations *in vitro*; however, it is clastogenic and induces sister chromatid exchanges in a variety of cell types, including human cells (USEPA 1988). Arsenic does not appear to induce chromosome aberrations *in vivo* in experimental animals; however, it may do so in humans (NRC 1977). Several studies also suggest that arsenic may affect DNA by the inhibition of DNA repair processes or by base-pair substitution (USEPA 1988).

Toxicity

Epidemiologic Data in Humans

Workers exposed to arsenic dusts in air may experience irritation to the mucus membrane of the nose and throat, which may lead to laryngitis, bronchitis, or rhinitis (Morton and Caron 1989). Very high exposures may cause perforation of the nasal septum (Pinto and McGill 1953). These effects, including perforation, were usually mild and did not result either in impaired respiration or illness. Several studies revealed that inhalation of high levels of arsenic dust or fumes led to nausea, vomiting, and diarrhea in workers (Beckett et al. 1986; Bolla-Wilson and Bleecker 1987; Morton and Caron 1989). Neurological injury may occur in humans after inhalation of inorganic arsenic, including peripheral neuropathy of sensory and motor neurons (numbness, loss of reflexes, muscle weakness) (Feldman et al. 1979; Landau et al. 1977). Hallucinations, agitation, emotional lability, and memory loss may also result (Beckett et al. 1986; Morton and Caron 1989). Adverse neurological effects tend to diminish, but may persist past exposure period (Beckett et al. 1986).

Developmental effects of arsenic exposure have been implicated in the unborn fetuses of pregnant women living near a copper-smelting plant in Bulgaria (Tabacova 1986). Fatal defects (e.g., small forebrains and underdeveloped earpits) occurred at a rate of 3.6 per 1,000 live births, which is three times the national rate. From a cohort of about 15,000 women living near the plant, increased placental concentration of arsenic, elevated lipid peroxides, and decreased GSH in maternal and cord blood were found. This suggested that arsenic was responsible for the oxidative damage in the pathogenesis of prenatal birth defects. The hypothesis was tested in an experimental *in vitro* mouse embryo model.

Systemic Toxicity

Chronic exposure of experimental animals to arsenic has been described by several studies. Tissues, which are adversely affected by arsenic exposure, include the gastrointestinal, cardiovascular, hematopoietic, renal, nervous, and respiratory systems.

In a chronic toxicity study (Byron et al. 1967), beagle dogs (6/group) were fed sodium arsenate or sodium arsenite at doses equivalent to 5, 25, 50, or 125 ppm arsenic in the diet, corresponding to an average daily dose of 0.2, 1.0, 2.1, or 5.2 mg As/kg-day with an assumed body weight of 12 kg for each dog. Four out of six dogs fed the highest dose of As died within 9 months. The main effects were anorexia and listlessness, with weight loss of 44-61 percent from the beginning of the study. Moderate anemia and atrophy of numerous tissues were revealed after hematologic and histologic examinations. A chronic NOAEL of 2.1 mg As/kg-day was identified in dogs since there was no difference between controls and dogs fed 50 ppm As^{3+} or As^{5+} in their diet.

In a 1-year study involving rhesus monkeys were exposed to As^{5+} (in the form of $2Na_3(PO_4AsO_4VO_4)$ "NaF" $18H_2O$) in milk at doses of 2.8 mg/kg-day (3-day and 8-week old monkeys) and 5.7 mg/kg-day (8-weeks old) (Heywood and Sortwell 1979). Effects seen in one monkey dosed with 2.8 mg As/kg-day beginning at 3 days of life included sudden weakness, dehydration along with bronchopneumonia, hemorrhage, edema, and necrosis in the brain. Another animal from the highest dose of arsenic had acute inflammation of the small intestine and moderate regression of the thymus. Surviving animals had normal EEGs and normal levels of neurological function. There was no evidence of delayed toxicity in surviving animals.

Male weanling Sprague-Dawley rats (10/group) were exposed to 0 or 50 ug/mL sodium arsenate for 320 days in drinking water (Carmignani et al. 1983). Histological examination revealed that the liver and kidneys accumulated significant levels of arsenic at 25.2 and 43.0 mg/kg, respectively, and swollen hepatocytes were noted near the centrilobular veins of the liver. Focal changes in the glomerulus and tubules were seen in the kidneys. No changes were noted in the myocardium, gastrocnemius, arterial vessels, lungs, brain, or sciatic nerves. Sympathetic hyperactivity, hypersensitivity, or both were induced by arsenic, and the authors speculated that these findings might explain the cardiovascular effects in people chronically exposed to arsenic.

CD male and female mice were fed 5 mg As^{3+}/L sodium arsenite in their drinking water, which corresponds to 0.35 mg/kg-day, in a special environment designed to minimize exposure to trace metals (Schroeder and Balassa 1967). After 180 days, growth rate and body weights were not affected, but a decrease in body weight in males was apparent after 360 and 540 days. There was also a decrease in survival rates at 18 months in males and 21 months in females, with a median life span that was reduced by 74 and 76 days in males and females, respectively.

Developmental Toxicity

High levels of arsenic can cause developmental effects in animals. Slight decreases in fetal weight resulted after mice were exposed to 2 mg As/m^3 as As_2O_3 on days 9-12 of gestation. Higher levels of arsenic (20 mg/m^3) produced skeletal malformations and an increase in fetal deaths (Nagymajtenyi et al. 1985). Other studies have reported an increase in fetal mortality

from 2-68 mg As/kg-day sodium arsenite (Baxley et al. 1981; Hood and Harrison 1982). Baxley et al. (1981) exposed pregnant CD-1 mice to single oral doses of 1, 20, 40, or 45 mg/kg sodium arsenate by gavage on days 8-15 of gestation. The frequency of dead or resorbed fetuses was significantly elevated in animals exposed to 40 or 45 mg/kg on days 10, 12, 13, 14, or 15 of gestation. Hood and Harrison (1982) exposed pregnant hamsters to a single gavage dose of 25 mg/kg sodium arsenite on days 8, 11, or 12 of gestation, or 20 mg/kg on days 9 or 10. Prenatal mortality was significantly elevated in animals dosed with 25 mg/kg on gestational days 8 or 12. Small increases in the percentage of fetuses that were malformed were noted in treated groups, although these were not significant. Similarly, Hood and Harrison (1982) performed a similar experiment in hamsters dosed by a single intraperitoneal amount of 5 mg/kg sodium arsenite on days 8, 11, or 12, or 2.5 mg/kg on days 9 or 10 of gestation. Again, prenatal mortality was elevated, and although there were small increases in malformations, they were not significant. Hood and Harrison concluded that arsenite is significantly less toxic when administered orally than intraperitoneally. Intraperitoneal injections of 45 mg/kg sodium arsenite on days 6-12 of gestation in pregnant Swiss-Webster mice resulted in the following fetal malformations: exencephaly, micrognathia, protruding tongue, agnathia, open eye, exophthalmos, anophthalmia, missing pinna, cleft lip, hydrocephalus, umbilical hernia, eventration, ectrodactyly, micromelia, limb and tail malformations, and skeletal defects. Similar adverse effects were seen in exposed Wistar rat fetuses (Beaudoin 1974), golden hamsters (Willhite 1981; Carpenter 1987).

Fetal mortality was increased and malformation resulted in experimental animals exposed to organic forms of arsenic. Albino CD rats and CD-1 mice given repeated doses DMA, a metabolite of arsenic, during gestation had significantly elevated fetal mortality and showed developmental effects: skeletal anomalies (delayed ossification and supernumerary ribs), malformed palate, cleft lip, reduced fetal weight (Rogers et al. 1981).

Reproductive Toxicity

In a three-generation reproductive toxicity study in Charles River mice given sodium arsenate in drinking water at an average dose of 0.35 mg As^{3+}/kg-day, no significant effects were detected, although a trend toward a decreased number of pups per litter and slightly altered male:female sex ratios were observed (from 1.03 to 1.30 in the F_2 generation, and from 1.00 to 1.71 in the F_3 generation (Schroeder and Mitchener 1971).

In another study, male and female Harlan/ICR Swiss mice dosed 3 times per week for 10 weeks with 0, 11.9, or 119 mg/kg-day MMA, a metabolite of As, prior to mating and during gestation produced fewer litters than normal (Prukop and Savage 1986). None of the animals receiving the highest dose of MMA produced litters, and only 50 percent of the animals dosed with 11.9 mg/kg-day MMA produced litters, compared with 80-100 percent in controls. This was attributed to decreased fertility of the male mice.

Other Systemic Effects

No studies have been located that discuss other systemic effects of exposure to arsenic in experimental animals.

Toxicokinetics

Most of the existing data on the toxicokinetics of arsenic is on the inorganic form. Both arsenate and arsenite are well absorbed by both the oral and inhalation routes.

Arsenic in air exists as particulate matter, and absorption by inhalation involves deposition of the particles onto the surface of the lungs and absorption of arsenic from the deposited material. Deposition was estimated to be about 40 percent and absorption was 75-85 percent in lung cancer patients exposed to arsenic in cigarette smoke (Holland et al. 1959), making the percentage of inhaled arsenic 30-34 percent. Animal studies on As (i.e., sodium arsenite, sodium arsenate, and arsenic trioxide) via intratracheal instillation suggest that nearly all of the deposited material is absorbed, because clearance of the compounds from the lungs was rapid and nearly complete (60-90 percent cleared within 1 day) (Marafante and Vahter 1987; Rhoads and Sanders 1985). In contrast, insoluble forms of As (i.e., arsenic sulfide and lead arsenate) cleared more slowly, suggesting that the rate of absorption is lower for the insoluble forms of arsenic (ATSDR 2007).

Absorption of arsenates and arsenites across the gastrointestinal tract is nearly complete. Measurements of human fecal excretions given oral doses of arsenite reported that less than 5 percent was recovered, indicating that absorption was about 95 percent (Bettley and O'Shea 1975). Again, ingestion of less insoluble forms of arsenic such as arsenic triselenide did not lead to a high percentage of absorption across the gastrointestinal tract (Mappes 1977). The data on dermal absorption of inorganic arsenic are limited and not quantitative.

Once absorbed, arsenic is distributed throughout the body to the liver, kidney, skeleton, gastrointestinal tract, and other tissues. Autopsies of people exposed to background levels of arsenic have revealed that arsenic is present in all tissues of the human body at approximately comparable concentrations (Liebscher and Smith 1968). Absorbed arsenic can also cross the placenta and be distributed to fetuses (Hood et al. 1987, 1988). The metabolites of both inorganic and organic arsenic appeared to be distributed equally in all body tissue following oral exposure (Takahashi et al. 1988; Yamauchi and Yamamura 1984, 1985; Stevens et al. 1977; Yamauchi et al. 1988).

A review by Thompson (1993) indicates that several *in vivo* and *in vitro* studies have elucidated the metabolic and detoxification pathway for arsenic in mammals (Vahter 1981; Vahter and Envall 1983; Hirata et al. 1988; Marafante and Vahter 1987; Takahashi et al. 1988; Maiorino and Aposhian 1985; Marafante et al. 1985; Vahter and Marafante 1983), including humans (Buchet et al. 1981a,b; Crecelius 1977; Lovell and Farmer 1985; Smith et al. 1977; Tam et al. 1979; Vahter 1986). Analysis of urinary excretion products from humans and animals revealed increased levels of inorganic As^{3+}, As^{5+}, methylarsonic acid (MMA), and dimethylarsonic acid (DMA). The metabolism of inorganic arsenic involve two processes: oxidation/reduction of As^{5+} and As^{3+} species and methylation. Specifically, inorganic arsenic is converted via methylation in the liver to MMA and to DMA, which is the principal metabolite. Both MMA and DMA form conjugates with glutathione or glutathione derivatives and are excreted in urine. Since methylation is enzyme-dependent, saturation kinetics appears to determine the toxicity, or carcinogenicity, of arsenic in humans. At low doses, arsenic can be effectively detoxified,

whereas at higher doses the detoxification pathway may become increasingly saturated, thereby increasing the possibility of macromolecular binding, resulting in pathological changes which could include tumors (Cheng et al. 1992; Smith et al. 1992). Data on the point at which saturation is reached is unclear.

Toxicity Values

Data by Tseng (1977) and Tseng et al. (1968) from a population epidemiology study in Taiwan were used to derive an ingestion RfD of 0.0003 mg/kg-day (USEPA 2010). The critical effects were considered to be hyperpigmentation, keratosis, and possible vascular complications. Since hyperpigmentation and keratosis of the skin are lesions that can progress to skin neoplasms, this toxic endpoint is considered to be appropriate for RfD derivation. The NOAEL is derived by multiplying the average concentration in drinking water by 4.5 L/day (because of the hot climate, typical daily drinking estimates are approximately doubled for this study population), adding in the contribution of arsenic in food, and dividing exposure by average body weight for Taiwanese adults (Abernathy et al. 1989). The RfD of 0.0003 mg/kg-day incorporates an additional uncertainty factor of 3 for the lack of data concerning the potential toxicity of arsenic. The inhalation RfC for arsenic is derived by the California Environmental Protection Agency (CalEPA) of $1.5x10^{-5}$ mg/m^3 based on effects to development, the cardiovascular system, and the nervous system (CalEPA 2008). The RfC is based upon a LOAEL of 0.23 ug As/$m^3$with an uncertainty factor of 30.

Considerable scientific controversy has surrounded the derivation of an estimated SF for arsenic by ingestion, principally drinking water. Based on a study in Taiwan (Tseng 1977; Tseng et al. 1968), USEPA has developed a drinking water unit risk of $5x10^{-5}$ $(ug/L)^{-1}$, which was used to generate an oral slope factor of 1.5 $(mg/kg\text{-}day)^{-1}$ (USEPA 2010). The SF for ingestion was adopted in this risk assessment for skin contact, as a default condition. The inhalation SF is based on the geometric means of several occupational epidemiologic studies in which a significant increase in the incidence of lung cancer occurred among workers exposed to high concentrations of airborne arsenic. The inhalation unit risk is $4.3x10^{-3}$ $(ug/m^3)^{-1}$, or $1.5x10^{-2}$ $(ug/kg\text{-}day)^{-1}$ (USEPA 2010).

References

Abernathy, C.O., W. Marcus, C. Chen, H. Gibb, and P. White. 1989. Memorandum to P. Cook, USEPA Office of Drinking Water, and P. Preuss, USEPA Office of Regulatory Support and Scientific Management, regarding Arsenic Work Group meetings. U.S. Environmental Protection Agency, Office of Drinking Water and Office of Research and Development, Washington, D.C., February 23.

ATSDR. 2007. *Toxicological Profile for Arsenic.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta. August.

Axelson, O., E. Dahlgren, C.D. Jansson, and S.O. Rehnlund. 1978. Arsenic exposure and mortality: A case referent study from a Swedish copper smelter. *Br. J. Ind. Med.* 35: 8-15.

Baxley, M.N., R.D. Hood, G.C. Vedel, W.P. Harrison, and G.M. Szczech. 1981. Prenatal toxicity of orally administered sodium arsenite in mice. *Bull. Environ. Contam. Toxicol.* 26: 749-756.

Bettley, F.R., and J.A. O'Shea. 1975. The absorption of arsenic and its relation to carcinoma. *Br. J. Dermatol.* 92: 563-568.

Beaudoin, A.R. 1974. Teratogenicity of sodium arsenate in rats. *Teratology* 10: 153-158.

Beckett, W.S., J.L. Moore, J.P. Keogh, and M.L. Bleecker. 1986. Acute encephalopathy due to occupational exposure to arsenic. *Br. J. Ind. Med.* 43: 66-67.

Bolla-Wilson, K., and M.L. Bleeker. 1987. Neuropsychological impairment following inorganic arsenic exposure. *J. Occup. Med.* 29: 500-503.

Brown, L.M., L.M. Pottern, and W.J. Blot. 1984. Lung cancer in relation to environmental pollutants emitted from industrial sources. *Environ. Res.* 34: 250-261.

Buchet, J.P., R. Lauwerys, and H. Roels. 1981a. Comparison of the urinary excretion of arsenic metabolites after a single oral dose of sodium arsenite, monomethyl arsonate or dimethyl arsinate in man. *Int. Arch. Occup. Environ. Health* 48: 71-79.

Buchet, J.P., R. Lauwerys, and H. Roels. 1981b. Urinary excretion of inorganic arsenic and its metabolites after repeated ingestion of sodium meta arsenite by volunteers. *Int. Arch. Occup. Environ. Health* 48: 111-118.

Byron, W.R., G.W. Bierbower, J.B. Brouwer, and W.H. Hansen. 1967. Pathological changes in rats and dogs from two-year feeding of sodium arsenite or sodium arsenate. *Toxicol. Appl. Pharmacol.* 10: 132-147.

CalEPA. 2008. *Technical Support Document for Noncancer RELs, Appendix D Individual Acute, 8-hour, and Chronic Reference Exposure Level Summaries*. December.

Carmignani, M., P. Boxcolo, and A. Iannaccone. 1983. Effects of chronic exposure to arsenate on the cardiovascular function of rats. *Br. J. Indust. Med.* 40: 280-284.

Carpenter, S.J. 1987. Development analysis of cephalic axial dysraphic disorders in arsenic-treated hamster embryos. *Anat. Embryol.* 176: 345-365.

Chen, C-J., CW. Chen, M-M. Wu, and T-L. Kuo. 1992. Cancer potential in liver, lung bladder and kidney due to ingested inorganic arsenic in drinking water. *Br. J. Cancer* 66: 888-892.

Crecelius, E.A. 1977. Changes in the chemical speciation of arsenic following ingestion by man. *Environ. Health Perspect.* 19: 147-150.

Enterline, P.E., and G.M. Marsh. 1982. Cancer among workers exposed to arsenic and other substances in a copper smelter. *Am. J. Epidemiol.* 116: 895-911.

Enterline, P.E., V.L. Henderson, and G.M. Marsh. 1987. Exposure to arsenic and respiratory cancer. A reanalysis. *Am. J. Epidemiol.* 125: 929-938.

Feldman, R.G., C.A. Niles, M. Kelly-Hayes, D.S. Sax, W.J. Dixon, D.J. Thompson, and E. Landau. 1979. Peripheral neuropathy in arsenic smelter workers. *Neurology* 29: 939-944.

Frost, F., L. Harter, S. Milham, R. Royce, A.H. Smith, J. Hartley, and P. Enterline. 1987. Lung cancer among women residing close to an arsenic emitting copper smelter. *Arch. Environ. Health* 42: 148-152.

Heywood, R., and R.J. Sortwell. 1979. Arsenic intoxication in the Rhesus monkey. *Toxicol. Lett.* 3: 137-144.

Holland, R.H., M.S. McCall, and H.C. Lanz. 1959. A study of inhaled arsenic-74 in man. *Cancer Res.* 19: 1154-1156.

Hood, R.D., and W.P. Harrison. 1982. Effects of prenatal arsenite exposure in the hamster. *Bull. Environ. Contam. Toxicol.* 29: 671-678.

Hood, R.D., G.C. Vedel-Macrander, M.J. Zaworotko, F.M. Tatum, and R.G. Meeks. 1987. Distribution, metabolism and fetal uptake of pentavalent arsenic in pregnant mice following oral or intraperitoneal administration. *Teratology* 35: 19-25.

Hood, R.D., G.C. Vedel, M.J. Zaworotko, F.M. Tatum, and R.G. Meeks. 1988. Uptake distribution and metabolism of trivalent arsenic in the pregnant mouse. *J. Toxicol. Environ. Health* 25: 423-434.

Ishinishi, N., A. Yamamoto, A. Hisanaga, and T. Inamasu. 1983. Tumorigenicity of arsenic trioxide to the lung in Syrian golden hamsters by intermittent instillations. *Cancer Lett.* 21: 141-147.

Landau, E.D., D.J. Thompson, R.G. Feldman, et al. 1977. *Selected Noncarcinogenic Effects of Industrial Exposure to Inorganic Arsenic.* Report No. USEPA 560/6-77-018. U.S. Environmental Protection Agency, Washington, D.C.

Liebscher, K., and H. Smith. 1968. Essential and nonessential trace elements. A method of determining whether an element is essential or nonessential in human tissue. *Arch. Environ. Health* 17: 881-890.

Lovell, M.A., and J.G. Farmer. 1985. Arsenic speciation in urine from humans intoxicated by inorganic arsenic compounds. *Hum. Toxicol.* 4: 203-214.

Maiorino, R.M., and H.V. Aposhian. 1985. Dimercaptan metal-binding agents influence the biotransformation of arsenite in the rabbit. *Toxicol. Appl. Pharmacol.* 77: 240-250.

Mappes, R. 1977. Experiments on the excretion of arsenic in urine. *Int. Arch. Occup. Environ. Health* 40: 267-272. (in German)

Marafante, E., and M. Vahter. 1987. Solubility, retention and metabolism of intratracheally and orally administered inorganic arsenic compounds in the hamster. *Environ. Res.* 42: 72-82.

Marafante, E., M. Vahter, and J. Envall. 1985. The role of the methylation in the detoxication of arsenate in the rabbit. *Chem. Biol. Interact.* 56: 225-238.

Morton, W.E., and G.A. Caron. 1989. Encephalopathy: An uncommon manifestation of workplace arsenic poisoning? *Am. J. Ind. Med.* 15: 1-5.

Nagymajtenyi, L., A. Selypes, and G. Berencsi. 1985. Chromosomal aberrations and fetotoxic effects of atmospheric arsenic exposure in mice. *J. Appl. Toxicol.* 5: 61-63.

NRC (National Research Council). 1977. *Drinking Water and Health*, pp. 331-333. National Academy of Sciences, Washington, D.C.

Ott, M.G., B.B. Holder, and H.I. Gordon. 1974. Respiratory cancer and occupational exposure to arsenicals. *Arch. Environ. Health* 29: 250-255.

Pershagen, G. 1985. Lung cancer mortality among men living near an arsenic-emitting smelter. *Am. J. Epidemiol.* 122: 684-694.

Pershagen, G., and N.E. Bjorklund. 1985. On the pulmonary tumorigenicity of arsenic trisulfide and calcium arsenate in hamsters. *Cancer Lett.* 27: 99-104.

Pinto, S.S., and C.M. McGill. 1953. Arsenic trioxide exposure in industry. *Ind. Med. Surg.* 22: 281-287.

Prukop, J.A., and N.L. Savage. 1986. Some effects of multiple, sublethal doses of monosodium methanearsonate (MSMA) herbicide on hematology, growth, and reproduction of laboratory mice. *Bull. Environ. Contam. Toxicol.* 36: 337-341.

Rhoads, K., and C.L. Sanders. 1985. Lung clearance, translocation and acute toxicity of arsenic, beryllium, cadmium, cobalt, lead, selenium, vanadium, and ytterbium oxides following deposition in rat lung. *Environ. Res.* 36: 359-378.

Rogers, E.H., N. Chernoff, and R.J. Kavlock. 1981. The teratogenic potential of cacodylic acid in the rat and mouse. *Drug Chem. Toxicol.* 4: 49-61.

Schroeder, H.A., and J.J. Balassa. 1967. Arsenic, germanium, tin and vanadium in mice: Effects on growth, survival and tissue levels. *J. Nutrition* 92: 245-252.

Schroeder, H.A., and M. Mitchener. 1971. Toxic effects of trace elements on the reproduction of mice and rats. *Arch. Environ. Health* 23: 102-106.

Smith, T.J., E.A. Crecelius, and J.C. Reading. 1977. Airborne arsenic exposure and excretion of methylated arsenic compounds. *Environ. Health Perspect.* 19: 89-93.

Smith, A.H., C. Hopenhayn-Rich, M.N. Bates, et al. 1992. Cancer risks from arsenic in drinking water. *Environ. Health Perspect.* 97: 259-267.

Sobel, W., G.G. Bond, C.L. Baldwin, and D.J. Ducommun. 1988. An update of respiratory cancer and occupational exposure to arsenicals. *Am. J. Ind. Med.* 13: 263-270.

Tabacova, S. 1986. Maternal exposure to environmental chemicals. *Neurotoxicology* 7: 421-440.

Takahashi, K., H. Yamauchi, N. Yamato, et al. 1988. Methylation of arsenic trioxide in hamsters with liver damage induced by long-term administration of carbon tetrachloride. *Appl. Organomet. Chem.* 2: 309-314.

Tam, G.K., S.M. Charbonneau, F. Bryce, C. Pomroy, and E. Sandi. 1979. Metabolism of inorganic arsenic (^{74}As) in humans following oral ingestion. *Toxicol. Appl. Pharmacol.* 50: 319-322.

Thompson, D.J. 1993. A chemical hypothesis for arsenic methylation in mammals. *Chem. Biol. Interact.* 88: 89-114.

Tseng, W.P. 1977. Effects and dose-response relationships of skin cancer and blackfoot disease with arsenic. *Environ. Health Perspect.* 19: 109-119.

Tseng, W.P., H.M. Chu, S.W. How, J.M. Fong, C.S.K. Lin, and S. Yeh. 1968. Prevalence of skin cancer in an endemic area of chronic arsenicism in Taiwan. *J. Nat. Cancer Inst.* 40: 453-463.

Vahter, M. 1981. Biotransformation of trivalent and pentavalent inorganic arsenic in mice and rats. *Environ. Res*. 25: 286-293.

Vahter, M. 1986. Environmental and occupational exposure to inorganic arsenic. *Acta Pharmacol. Toxicol.* 59: 31-34.

Vahter, M., and J. Envall. 1983. *In vivo* reduction of arsenate in mice and rabbits. *Environ. Res*. 32:14-24.

Vahter, M., and E. Marafante. 1983. Intracellular interaction and metabolic fate of arsenite and arsenate in mice and rabbits. *Chem. Biol. Interact.* 47: 29-44.

Willhite, C.C. 1981. Arsenic-induced axial skeletal (dysraphic) disorders. *Exp. Mol. Pathol.* 34: 145-158.

Yamauchi, H., and Y. Yamamura. 1984. Metabolism and excretion of orally administered dimethylarsinic acid in the hamster. *Toxicol. Appl. Pharmacol.* 74: 134-140.

Yamauchi, H., and Y. Yamamura. 1985. Metabolism and excretion of orally administered arsenic trioxid in the hamster. *Toxicology* 34: 113-121.

Yamauchi, H., N, Yamato, and Y. Yamamura. 1988. Metabolism and excretion of orally and intraperitoneally administered methylarsonic acid in the hamster. *Bull. Contam. Environ. Toxicol.* 40: 280-286.

USEPA. 1988. *Special Report on Ingested Inorganic Arsenic; Skin Cancer; Nutritional Essentiality.* Report No. EPA/625/3-87/013. USEPA, Risk Assessment Forum, Washington, D.C. July.

USEPA. 2010. IRIS (Integrated Risk Information System) on-line database maintained on the Internet at http://www.epa.gov/iris by U.S. EPA Environmental Criteria and Assessment Office, Cincinnati.

COBALT

Cobalt (Co, CAS Registry No. 7440-48-4) occurs in nature in many different chemical forms. The pure metal is gray, magnetic, ductile, and somewhat malleable. Cobalt and other cobalt compounds are commonly used to make metal alloys. Small amounts of cobalt are found in food. Cobalt is a component of vitamin B_{12} and is required for good health in humans. Cobalt also can be artificially induced to become radioactive. Cobalt-60 breaks down to form beta particles and gamma radiation, and is used in cancer treatment, storage of wheat and potatoes, sterilization of spices and medical equipment, and processes to locate buried telephone and electric lines. Naturally occurring cobalt can stay in the air for a few days and will remain in water and soil for years (ATSDR 2004).

Carcinogenicity

"likely to be carcinogenic to humans by the inhalation route," based on both the limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in animals as shown by a statistically significant increased incidence of alveolar/bronchiolar tumors in both sexes of rats and mice, pheochromocytomas in female rats, and hemangiosarcomas in male mice (Bucher et al., 1999). (USEPA 2008). Human studies have suggested a possible association between exposure to cobalt and respiratory tumors in cobalt workers (Tuchsen et al., 1996; Mur et al., 1987; Morgan et al., 1983). However, these studies have a number of limitations, including small numbers of subjects, inadequate exposure assessment and potential exposure to other chemicals make them inadequate for assessing the carcinogenic potential of cobalt. Studies for evaluation of the oral carcinogenic potential for cobalt were not located (USEPA 2008).

Mutagenicity

Generally, evaluations of mutagenic effects in bacteria yield negative results. However, mammalian cell systems have shown cobalt may be genotoxic in mammalian cells. Limited data from in vivo animal studies have also suggested genotoxic effects of cobalt, including chromosomal breaks, chromosomal aberrations, and micronucleus formation (USEPA 2002).

Systemic Toxicity

Cobalt has been found to produce adverse effects via the inhalation, oral, and dermal routes. Two studies have been found that suggest a relationship between cobalt exposure and death from lung cancer and cardiomyopathy. In a study by Mur et al. 1987, authors compared mortality in plant workers that worked in a cobalt and sodium refinery and processing facility. An increase in lung cancer related deaths was found in the cohort exposed to cobalt (SMR=4.66; 4 deaths in the cobalt exposed group compared to 1 death in controls). A medical case study reported the death of a metal worker due to cardiomyopathy. High levels of cobalt were found in the tissue and death was attributed to the exposure of high levels of cobalt for 4 years (Barborik and Dusek 1972). Autopsy of this worker also found congestion of the kidneys, congestion of the liver, congestion of the conjunctiva (ocular effect).

Occupational studies have also reported respiratory effects such as irritation, wheezing, asthma, pneumonia and fibrosis. The workers were exposed to 0.003 to 0.893 mg/m^3 for 2-17 years (Anttila et al. 1986; Davison et al. 1983; Demedts et al. 1984; Raffin et al. 1988; Shirakawa et al. 1988, 1989; Sprince et al. 1988; Tabatowski et al. 1988; Van Cutsem et al. 1987).
Cobalt is reported to act synergistically in combination with alcohol or antibiotics. Cardio-vascular effects were observed in people who consumed beer containing cobalt sulfate (used as a foam stabilizer) (Alexander 1969, 1972; Morin et al. 1971) The beer drinkers ingested from 0.04 mg/kg/day to 0.14 mg/kg/day of cobalt for years. Effects included cardiomyopathy characterized by: sinus tachycardia, left ventricular failure, cardiogenic shock, diminished myocardial compliance, absence of a myocardial response to exercise, enlarged heart, and extensive intracellular changes.

In animal studies the LD_{50} has been determined for Wistar rats, ranging from 91 mg/kg (for cobalt fluoride) to 190 mg/kg (for cobalt chloride) depending on the cobalt compound (Speijers et al. 1982). Sprague Dawley rats gavaged with cobalt chloride reported death at 161 mg/kg (Domingo and Llobet 1984).

Rats exposed to 26-30.2 mg/kg/day of cobalt sulfate in the diet or cobalt chloride in drinking water for 2-3 months were observed to have degenerative heart lesions and increased heart weight (Grice et al. 1969; Domingo et al. 1984).

Speijers et al. (1982) observed acute and prolonged exposure to cobalt resulted in renal tubular degeneration in rats exposed to 42 mg/kg.

Toxicokinetics

Inhaled cobalt powder is retained in the lungs and subsequently absorbed slowly. Significant amounts have been found in hair and in the liver and pancreas after exposure. About 10 percent of that absorbed persists for 5-15 years. The rest is rapidly excreted in feces and urine. Absorption of cobalt is reduced by the simultaneous administration of iron.

Metabolism

Cobalt directly induces metallothionein synthesis in hepatic tissue and stimulates the production of erythropoietin. It is thought that these are a response to tissue hypoxia resulting from an inhibition of enzymes involved in oxidative metabolism. More specifically, cobalt blocks the conversion of pyruvate to acetyl coenzyme A and of alpha-ketoglutarate to succinate.

Toxicity Values

USEPA has published a PPRTV RfD of $3x10^{-4}$ mg/kg/day based on a LOAEL of 1 mg/kg-day for decreased iodine uptake in humans (USEPA 2008). An applied uncertainty factor of 1,000 (10 for LOAEL to NOAEL extrapolation, 10 for lack of inter-individual human variability, 10 for protection of sensitive populations, 3 for lack of multi-generation toxicity study, and 10 for extrapolating from subchronic to chronic duration. The USEPA notes a low confidence in the provisional chronic RfD results (USEPA 2008). This is based upon the inability to determine a

relationship between long-term oral cobalt exposure and an increased in thyroid effects. The RfD is based upon a LOAEL, but the USEPA noted that prolonged cobalt exposure could have less of an effect on the thyroid (USEPA 2008).

References

Alexander, C.S. 1969. Cobalt and the heart. *Ann. Int. Med.* 70:411-413.

Alexander, C.S. 1972. Cobalt-beer cardiomyopathy: a clinical and pathologic study of twenty eight cases. *Am. J. Med.* 53: 395-417.

Anttila S., S. Sutinen, M. Paananen et al. 1986. Hard metal lung disease: a clinical histological, ultrastructural and X-ray microanalytical study. *Eur. J. Respir. Dis.* 69: 83-94.

ATSDR. 2004. *Toxicological Profile for Cobalt*. U.S. Department of Health and Human Services, Public Health Service. April.

Barborik R. and R. Dusek. 1972.Cardiomyopathy accompanying industrial cobalt exposure. *Br. Heart J.* 34:113-116.

Davison, A.G., P.L. Haslam, B. Corrin, et al. 1983. Interstitial lung disease and asthma in hard-metal workers: broncholalveolar lavage, ultrastructural and analytical findings and results of bronchial provocation test. *Thorax* 38: 119-128.

Demedts, M., B. Gheysens, J. Nagels, et al. 1984. Cobalt lung in diamond polishers. *Am. Rev. Respir. Dis.* 130: 130-135.

Domingo, J.L., J.M. Llobet. 1984. Treatment of acute cobalt intoxication in rats with L-methionine. *Rev. Esp. Fisiol.* 40: 443-448.

Domingo, J.L., J.M. Llobet, and R. Bernat. 1984. A study of the effects of cobalt administered orally to rats. *Arch. Farmacol. Toxicol.* 10: 13-20.

Grice, H.C., T. Goodman, I.C. Munro, et al. 1969. Myocardial toxicity of cobalt in the rat. *Ann. N.Y. Acad. Sci.* 156: 189-194.

Morin Y., A. Tetu, and G. Mercier. 1971. Cobalt cardiomyopathy: Clinical aspects. *Br. Heart J.* 33: 175-178.

Mur, J.M., J.J. Charruyer-Seinerra, et al. 1987. A cohort mortality study among cobalt and sodium workers in an electrochemical plant. *Am. J. Ind. Med.* 11: 75-82.

Raffin E., S. Middelsen, D.G. Altman, et al. 1984. Cobalt therapy prophylaxis of recurrence of T1 bladder cancer. *Prog. Clin. Biol. Res.* 162B: 33-37.

Shirakawa T.Y. Kusaka, N. Fujimara. et al. 1988. The existence of specific antibodies of to cobalt in hard metal asthma. *Clin. Allergy* 18: 451-460.

Shirakawa T.Y. Kusaka, N. Fujimara, et al. 1989. Occupational asthma from cobalt sensitivity in workers exposed to hard metal dust. *Chest* 95: 29-37.

Speijers, G.J.A., Krajnc, E.I., Berkvens J.M., et al. 1982. Acute oral toxicity of inorganic cobalt compounds in rats. *Food Chem. Toxicol.* 20: 331-314.

Sprince, N.L., L.C., Oliver, E.A. Eisen, et al. 1988. Cobalt exposure and lung disease in tungsten carbide production: A cross-sectional study of current workers. *Am. Rev. Respir. Dis.* 138: 1220-1226.

Tabatowski, K., V.L. Roggli W.J. Fulkerson, et al. 1989. The organ distribution of liposome-encapsulated and free cobalt in rats. Liposomes decrease the cardia uptake of metal. *Life Sci.* 45: 729-736.

USEPA. 2008. *Provisional Peer Reviewed Toxicity Values for Cobalt (CASRN 7440-48-4).* Superfund Technical Support Center, National Center for Environmental Assessment. August 25.

Van Cutsem, E.J., J.L. Ceuppens, L.M. Lacquet, et al. 1987. Combined asthma and alveolitis induced by cobalt in a diamond polisher. *Eur. J. Respir. Dis.* 70: 54-61.

IRON

Iron (Fe, CAS registry number 7439-89-6) is the fourth most abundant element in the earth's crust and the second most abundant metal. It comprises approximately 5 percent of the continental crust. Its concentration in ground water ranges from 0.5 mg/L to 10 mg/L; its concentration in soil is between 0.7 and 4.2 percent (NRC 1979). In the late 1970s, world production of iron was over 500 million metric tons, with the U.S. producing roughly 20 percent of the world total (NRC 1979). Since iron is an essential nutrient, some amount of iron is needed in the diet.

Carcinogenicity

Iron has not been reported to be mutagenic (NRC 1979). It has not been classified with respect to carcinogenicity, given the paucity of animal cancer bioassays and human cancer studies. Iron overload may be associated with carcinoma of the liver; however the data are poor and inconclusive (NRC 1979).

The acute effects of iron toxicity in humans are well characterized and consist of gastrointestinal, cardiovascular, metabolic, neurological and hepatic alterations (Bothwell et al. 1979; Banner and Tong 1986; Engle et al. 1987; and Mann et al. 1989, all as cited in USEPA 1993). Acute effects are based mostly on observations of children who accidentally ingest therapeutic iron supplements; they are rarely, if ever, associated with ingestion of naturally occurring or other commercially produced substances (NRC 1979). Gastrointestinal toxicity is characterized by vomiting, diarrhea, and abdominal pain, caused by the direct caustic effect of iron on the mucosa of the stomach and small intestine. Gastrointestinal toxicity can progress to gastric/intestinal hemorrhage and/or necrosis and, in rare cases, to stenosis in the stomach outlet and small intestine. Cardiovascular iron toxicity is marked by severe hemodynamic alterations and can lead to shock and cardiac failure; neurological toxicity ranges from lethargy to coma. Although a rare occurrence, hepatic toxicity from iron can range from cloudy swelling of hepatocytes to necrosis. The average human lethal dose is 200B250-mg/kg body weight (NRC 1979). Thus, the average adult male would have to ingest 14 grams of elemental iron for it to be lethal; the average 2 year old, 3 grams (NRC 1979).

Chronic iron toxicity has been noted in individuals with various genetic and/or metabolic disorders, including hemochromatosis (massive iron overload together with cirrhosis and/or other tissue damage due to iron), thalassemia, and sideroblastic anemia, as well as in individuals who receive frequent blood transfusions (Jacobs 1977, and Bothwell et al. 1979, both as cited in USEPA 1993). Excessive intake of iron attributed to consumption of home-brewed Kaffir beer has resulted in chronic hemochromatosis among the South African Bantu population (NRC 1979; and Bothwell and Bradlow 1960; and Bothwell et al. 1964, both as cited in USEPA 1993). Pathologic findings associated with hemochromatosis include: 1) fibrosis in heavily siderotic organs, particularly the liver, 2) cirrhosis, 3) testicular atrophy, and 4) osteoporosis (NRC 1979).

Though chronic iron toxicity can occur in individuals with genetic/metabolic disorders, it is debatable whether a chronic overload via ingestion is possible in individuals with a normal ability to control iron absorption. Using values obtained from the second National Health and

Nutrition Examination Survey (NHANES II), Looker et al. (1988, as cited in USEPA 1993) compared dietary iron intake with biochemical indices of iron status. NHANES II consisted of a 1976B1980 sample of the U.S. population aged 6 months to 74 years. Observed intake levels of 0.15B0.27 mg/kg-day iron were found to be both great enough to prevent iron deficiency and insufficient to cause the toxic effects of iron overload (Elinder 1986; Cook 1991; Hillman and Finch 1985, all as cited in USEPA 1993). Lauffer (1991, as cited in USEPA 1993) and Sullivan (1992, as cited in USEPA 1993) suggest that iron overload elevates the risk of acute myocardial infarction by promoting oxidation of low-density lipoprotein (LDL). A 1992 Finnish study of 1,931 randomly selected men aged 42B60 years by Salonen et al. lends support to this theory in that it found that high serum ferritin concentration and high dietary iron intake were risk factors for myocardial infarction.

Animal studies attempting to model hemochromatosis have been mostly negative, as have animal studies involving parenteral administration of iron (Bothwell et al. 1979, as cited in USEPA 1993; and NRC 1979).

Ingestion of iron supplements during pregnancy has not been correlated to adverse developmental effects in humans, although some women ingesting large quantities of iron (>1.2 gram) during pregnancy experienced nausea, vomiting, hematoemesis, abdominal pain, and/or diarrhea (NAS 1989, as cited in USEPA 1993). No teratogenic effects have been associated with iron (NRC 1979).

No treatment-related teratogenic or embryotoxic effects were observed in rats given 2.7 mg/kg-day iron on gestation days 6-15 or rats/mice given 24-76 mg/kg-day iron for 6 days (Nolen et al. 1972; Tadokoro et al. 1979, as cited in USEPA 1993).

This essential nutrient is found primarily in the form of hemoglobin in the body. The concentration of iron in the body at any given point is regulated largely through changes in the amount of iron absorbed by the gastrointestinal mucosa. The following factors influence the absorption of iron: 1) body stores, 2) the amount and nature of iron in ingested food, and 3) dietary factors that may increase or decrease the availability of iron for absorption (NRC 1979). Although the body is generally effective in regulating iron levels, it is incapable of excreting large amounts of iron following excessive accumulation resulting from acute or chronic ingestion of high levels of iron (NAS 1989, as cited in USEPA 1993).

Toxicity Values

The USEPA has identified an provisional oral RfD of 0.7 mg/kg-day based upon effects to the digestive system (USEPA 2006). The LOAEL of 1 mg/kg-day is modified by an uncertainty factor of 1.5 (1.5 for for use of a minimal LOAEL, 1 for sensitive individuals, 1 for less than lifetime exposure, and 1 for an adequate data base. An uncertainty factor of 1.5 was applied to account for extrapolation from a minimal LOAEL to a NOAEL for a non-serious effect) (USEPA 2006).

References

ACGIH (American Conference of Governmental Industrial Hygienists). 1995. *1995B1996 Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)*. ACGIH, Cincinnati, Ohio.

Banner, Jr., W. and T.G. Tong. 1986. Iron poisoning. *Pediatr. Toxicol*. 33(2): 393-409.

Bothwell, T.H., and B.A. Bradlow. 1960. Siderosis in the Bantu: A combined histopathological and chemical study. *Arch. Pathol*. 70: 279-292.

Bothwell, T.H., H. Seftel, P. Jacobs, J.D. Torrance, and N. Baumslag. 1964. Iron overload in Bantu subjects: Studies on the availability of iron in Bantu beer. *Am. J. Clin. Nutr*. 14: 47-51.

Bothwell, T.H., R.W. Charlton, J.D. Cook, and C.A. Finch. 1979. *Iron Metabolism in Man.* Blackwell Scientific Publications, Oxford, UK.

USEPA. 2006. Peer Reviewed Toxicity Value for Iron and Compounds (CASRN 7439-89-6). Superfund Health Risk Technical Support Center, USEPA National Center for Environmental Assessment. September 11.

MANGANESE

Manganese (Mn; CAS Registry No. 7439-96-5) is a pinkish gray, lustrous and brittle metal that is used in rock crushers and in the manufacture of ceramics, matches, glass, dyes, welding rods. It is a component of steel and metal alloys. (ATSDR 2008).

Cancer

USEPA considers manganese to be unclassifiable as a human carcinogen (Category D), based on an absence of human carcinogenicity data, inadequate evidence of carcinogenicity in animals, and inadequate genotoxicity data (USEPA 2010).

Mutagenicity

Few genotoxicity assays of manganese have been conducted. No studies were located regarding genotoxic effects in humans (ATSDR 2008). Treatment of male rats with manganese at repeated oral doses of 0.014 mg/kg-day manganese for 80 days did not produce any significant chromosomal damage in bone marrow or sperm cells (Dikshith and Chandra 1978). Results of *in vitro* genotoxicity assays have been mixed. The available data indicate that manganese may have genotoxic potential, but they are not sufficient to evaluate the genotoxic risk of manganese to humans (ATSDR 2008).

Systemic Toxicity

Humans exert an efficient homeostatic control over manganese so that body burdens are kept constant with variations in diet. Manganese is an essential element, being required for normal human growth and maintenance of health. Children may be less susceptible to manganese intoxication and may require slightly higher levels of manganese than do adults (USEPA 2010).

The World Health Organization (WHO 1973) reviewed several investigations of adult diets and reported the average daily consumption of manganese to range from 2.0 to 8.8 mg/day. Higher manganese intakes are associated with diets high in whole-grain cereals, nuts, green leafy vegetables, and tea. Depending on individual diets, a normal intake may be well over 10 mg Mn/day, especially from a vegetarian diet. While the actual intake is higher, the bioavailability of manganese from a vegetarian diet is lower, thereby decreasing the actual absorbed dose. From manganese balance studies, the WHO concluded that 2-3 mg/day is adequate for adults and that 8-9 mg/day is “perfectly safe” (WHO 1973).

An epidemiologic study of manganese in drinking water was performed by Kondakis et al. (1989). Three areas in northwest Greece were chosen for this study, with manganese concentrations in natural well water of 3.6-14.6 ug/L in area A, 81.6-252.6 ug/L in area B, and 1,600-2,300 ug/L in area C. The total population of the 3 areas being studied ranged from 3,200 to 4,350 people. Although the amount of manganese in the diet was not reported, the authors indicated that most of the food was purchased from markets. The individuals chosen were submitted to a neurologic examination, the score of which represents a composite of the presence and severity of 33 symptoms (e.g., weakness/fatigue, gait disturbances, tremors, dystonia).

Whole blood and hair manganese concentrations were also determined. The authors indicate that the difference in mean scores for area C versus A was significantly increased for both sexes combined. In a subsequent analysis, logistic regression indicated that there is a significant difference between areas A and C, even when both age and sex are taken into account (Kondakis 1990). The NOAEL identified in this epidemiological study was 0.005 mg/kg-day (USEPA 2010).

The major toxic effects of inhaled manganese are primarily neurological. A syndrome called "manganism" has been observed only in workers exposed to chronic, high levels of manganese. It is characterized by preliminary general weakness, anorexia and muscle pain, with psychological signs such as apathy and dullness, as well as impotence. Advanced stages include difficulty in walking, muscle tremor, and behavioral disturbances. This syndrome has not been observed for low level, chronic or sporadic exposures, nor has it been observed in studies with animals (ATSDR 2008).

Roels et al. (1992) conducted a cross-sectional study of 92 male workers exposed to manganese dioxide (MnO_2) dust in a Belgian alkaline battery plant. A control group of 101 male workers was matched for age, height, weight, work schedule, coffee and alcohol consumption, and smoking; educational level was slightly higher in the control group. The manganese-exposed group had been exposed to MnO_2 for an average of 5.3 years (range: 0.2-17.7 years). The geometric means of the workers' TWA airborne manganese concentrations, as determined by personal sampler monitoring at the breathing zone, were 0.215 mg/m^3 for respirable dust and 0.948 mg/m^3 for total dust. The authors noted that the personal monitoring data were representative of the usual exposure of the workers because work practices had not changed during the last 15 years of the operation of the plant.

Geometric mean concentrations of blood manganese (MnB) (0.81 ug/dL) and urinary manganese (MnU) (0.84 ug/g creatinine) were significantly higher in the Mn-exposed group than in the control group, but on an individual basis no significant correlation was found between either MnB or MnU and various external exposure parameters. A self-administered questionnaire focused on occupational and medical history, neurological complaints, and respiratory symptoms. Responses to the questionnaire indicated no significant differences between groups in either respiratory or neurological symptoms, nor were spirometric, hormonal, or calcium metabolism measurements significantly different for the two groups (Roels et al 1992).

Of particular note, manganese workers performed worse than controls on several measures of neurobehavioral function. Visual reaction time was consistently and significantly slower in the manganese-exposed workers measured in four 2-minute periods, with more pronounced slowing over the total 8-minute period and significantly greater variability in reaction times for the exposed group. Abnormal values for mean reaction times (defined as greater than or equal to the 95th percentile of the control group) also were significantly more prevalent in the exposed group during three of four 2-minute intervals of the 8-minute testing period. Five measures of eye-hand coordination (precision, percent precision, imprecision, percent imprecision, and uncertainty) reflected more erratic control of fine hand-forearm movement in the exposed group than in the controls, with mean scores on all five measures being highly significantly different for the two groups. There was also a significantly greater prevalence of abnormal values for

these five measures in the manganese-exposed group. The hole tremormeter test of hand steadiness indicated a consistently greater amount of tremor in the exposed workers, with performance for two of the five hole sizes showing statistically significant impairment (Roels et al. 1992).

A LOAEL may be derived from the Roels et al. (1992) study by using the IRD concentration of MnO_2, expressed as mg/m^3 years (based on 8-hour TWA occupational exposures for various job classifications, multiplied by individual work histories in years). Dividing the geometric mean IRD concentration (0.793 mg/m^3 years) by the average duration of the workers' exposure to MnO_2 (5.3 years) yields a LOAEL of 0.15 mg/m^3. Adjusted for continuous exposure, the LOAEL is 0.05 mg/m^3.

Roels et al. (1987) conducted a cross-sectional study in 141 male workers exposed to MnO_2, manganese tetroxide (Mn_3O_4), and various manganese salts (sulfate, carbonate, and nitrate). A matched group of 104 male workers was selected as a control group. The two groups were matched for socioeconomic status and background environmental factors; in addition, both groups had comparable work-load and work-shift characteristics. Significant differences in mean scores between manganese-exposed and reference subjects were found for objective measures of visual reaction time, eye-hand coordination, hand steadiness, and audio-verbal short-term memory. The prevalence of abnormal scores on eye-hand coordination and hand steadiness tests showed a dose-response relationship with blood manganese levels; short-term memory scores were related to years of manganese exposure but not to blood manganese levels. The prevalence of subjective symptoms was greater in the exposed group than in controls for 20 of 25 items on the questionnaire, with four items being statistically significant: fatigue, tinnitus, trembling of fingers, and irritability. Based upon the findings of impaired neurobehavioral function in workers whose average Mn exposure was estimated by the geometric mean TWA of total airborne manganese dust at the time of the study, a LOAEL of 0.97 mg/m^3 was identified, which, when adjusted for continuous exposure, is equivalent to a LOAEL of 0.34 mg/m^3. This LOAEL is based on total manganese dust of mixed forms, whereas the LOAEL from Roels et al. (1992) study is based on the measured respirable dust fraction of MnO_2 only.

Minimal information regarding manganese and the dermal exposure route could be located. It is generally regarded that manganese uptake across intact skin is very limited, as is the case for most inorganic forms of metal ions (ATSDR 2008).

Toxicokinetics

Exposure to manganese mainly occurs via ingestion and inhalation. The extent to which manganese is absorbed across the intestine is approximated at 3-5 percent, and does not appear to be substantially influenced by the carrier medium (i.e., water versus food). Similar extents of absorption have been noted in animals as well, with typical amounts equal to 2.5-5.5 percent. Manganese distributes to various tissues following ingestion, and serves as a normal tissue constituent. Tissue levels may be somewhat higher in animal tissues than in their human tissue counterparts. Manganese which is inhaled, typically in particle form, is absorbed to some unknown extent across the lungs, and a certain percentage of inhaled manganese particles are subsequently swallowed and ingested as well (ATSDR 2008).

Metabolism

Manganese is not known to be metabolized or biotransformed, and behavior within the body would be essentially limited to absorption, distribution, potential sequestration, and excretion. The valence state of manganese is thought to undergo changes within the body (alterations in oxidation state), which may influence its ability to form complexes or serve as a co-factor for certain proteins (ATSDR 2008).

Toxicity Values

The information used to determine the RfD for manganese in food was taken from many large populations consuming normal diets over an extended period of time with no adverse health effects (WHO 1973; NRC 1989; Schroeder et al. 1966). A NOAEL of 0.14 mg/kg-day (corresponding to 10 mg/day for a 70 kg adult) is based on a composite of data from all three references. The Food and Nutrition Board of the National Research Council (NRC 1989) determined an "adequate and safe" intake of manganese to be 2-5 mg/day for adults. This level was chosen because it includes an "extra margin of safety" from the level of 10 mg/day, which the NRC considered to be safe for an occasional intake. To evaluate exposure to manganese in all other exposure pathways besides diet, the USEPA recommends modifying the oral RfD by a factor of 3 (USEPA 2010).

The inhalation RfC for manganese is based on a LOAEL of 0.05 mg/m^3 as determined by Roels et al. (1992) (USEPA 2010). An uncertainty factor of 1,000 reflects factors of 10 to protect sensitive individuals, 10 for use of a LOAEL, and 10 for database limitations reflecting both the less than chronic periods of exposure and the lack of developmental data, as well as potential but unquantified differences in the toxicity of different forms of manganese. Thus, the RfC is $5x10^{-5}$ mg/m^3, which is equivalent to an inhalation RfD of $1.4x10^{-1}$ mg/kg-day. No cancer slope factors can be calculated for manganese at this time because of a lack of data.

References

ATSDR. 2008. *Draft Toxicological Profile for Manganese and Compounds.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. September.

Dikshith, T.S. and S.V. Chandra. 1978. Cytological studies in albino rats after oral administration of manganese chloride. *Bull. Environ. Contam. Toxicol.* 19:741-746.

Freeland-Graves, J.H., C.W. Bales and F. Behmardi. 1987. Manganese requirements of humans. Pp. 90-104 in C, Kies, Ed. *Nutritional Bioavailability of Manganese*. American Chemical Society, Washington, D.C.

Kondakis, X.G., N. Makris, M. Leotsinidis, M. Prinou, and T. Papapetropoulos. 1989. Possible health effects of high manganese concentration in drinking water. *Arch. Environ. Health* 44: 175-178.

Kondakis, X.G. 1990. Letter to S. Velazquez, U.S. Environmental Protection Agency, Cincinnati, OH. University of Patras, Greece. August 23.

NRC (National Research Council). 1989. Manganese. Pp. 230-235 in *Recommended Dietary Allowances*, 10th ed. National Academy Press, Washington, D.C.

Roels, H.A., P. Ghyselen, J.P. Buchet, E. Ceulemans, and R.R. Lauwerys. 1992. Assessment of the permissible exposure level to manganese in workers exposed to manganese dioxide dust. *Br. J. Ind. Med.* 49: 25-34.

Schroeder, H.A., J.J. Balassa, and I.H. Tipton. 1966. Essential trace metals in man: Manganese, a study in homeostasis. *J. Chron. Dis.* 19: 545-571.

USEPA. 1994. *Health Effects Assessment Summary Tables FY-1994 Annual (Including Supplements 1 and 2).* Report No. EPA/540/R-94/020. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. March.

USEPA. 2010. IRIS (Integrated Risk Information System) on-line database maintained on the Internet at http://www.epa.gov/iris by U.S. Environmental Protection Agency Environmental Criteria and Assessment Office, Cincinnati.

WHO. 1973. *Trace Elements in Human Nutrition: Manganese.* Report of a WHO Expert Committee. Technical Report Service 532. World Health Organization, Geneva, Switzerland. Pp. 34-36.

MERCURY

Inorganic mercury (Hg; CAS Registry number 7439-97-6) is a ubiquitous metallic element and one of the most widely studied toxicants.

Cancer

At present, EPA considers mercury to be a possible human carcinogen (Category C), based on an absence of human carcinogenicity data, inadequate evidence of carcinogenicity in animals, and inadequate genotoxicity data (USEPA 2001).

Animal carcinogenicity studies are briefly summarized by EPA (USEPA 2001):

> When 39 rats were injected *i.p.* over 2 weeks with metallic mercury and observed for their lifetimes, sarcomas were seen only in those tissues that had been in direct contact with the metal (Druckrey et al. 1957). No concurrent controls were reported.
>
> Mitsumori et al. (1981) fed groups of 60 male and 60 female SPF ICR mice 0, 15 or 30 ppm methyl mercury chloride in the diet for up to 78 weeks. The majority of the 30 ppm groups died from neurotoxicity by week 26. Histopathology on kidney tissue from all animals surviving after 53 weeks revealed renal tumors in 13 of 16 males in the 15 ppm group (2 adenomas, 11 adenocarcinomas). One adenoma was detected among 37 controls surviving to week 53 or beyond, and no tumors were seen in either control or exposed females. The possible presence of tumors at other sites was not reported in this preliminary communication.
>
> The relevance of data from studies of organic mercury to the possible carcinogenicity of inorganic mercury is uncertain.

Mutagenicity

Limited evidence has shown that exposure to mercury can cause adverse effects in the number or structure of chromosomes. In a comparison between four men exposed to mercury vapor and controls who were unexposed, the exposed group showed a statistical increase in the incidence of chromosomal aberrations in white blood cells (Popescu et al. 1979). Mabille et al. (1984), studied the chromosomal structure of occupationally exposed workers to mercury and did not find any significant increases in structural aberrations.

Methyl mercury hydroxide administered in the diet to *Drosophila melanogaster* at 5 mg/L induced chromosomal nondisjunction, while methyl and phenyl mercury produced small increases in the rate of point mutations (Ramel 1972).

Systemic Toxicity

Ingestion is one of the primary routes of exposure to mercury, but elemental mercury is only very poorly absorbed from the gastrointestinal tract (probably less than 0.01 percent) (Hammond

and Beliles 1980). While CNS effects are the typical target organ effects observed following inhalation exposures, renal effects are the primary target of ingested inorganic mercury. In chronic exposures, nephrotoxicity is typically manifest as proteinuria; in severe cases, the nephrotic syndrome is observed, with subsequent edema and hypoproteinemia (Hammond and Beliles 1980).

The major toxic effects of inhaled mercury are primarily neurological. In acute exposure scenarios, clinical signs include paresthesia, ataxia, dysarthria, and deafness (Berlin 1979). Chronic exposure typically involves exposure to both mercury vapor and divalent mercury. Toxic symptoms include renal damage with nephrotic syndrome as well as increased salivation, inflammatory changes of the gums and the appearance of black lines along the gums (Skerfving and Vostal 1972).

In historical medicinal preparations, treatment with mercury compounds produced skin reactions such as erythema and dermatitis (Bhamra and Costa 1992). Other clinical signs include irritation, desquamation and loss of hair, ulcerations, hyperplasia, and hyperkeratosis (Bhamra and Costa 1992; Matheson et al. 1980).

Toxicokinetics

Exposure to mercury mainly occurs via inhalation and ingestion. Absorption of mercury from the respiratory and gastrointestinal tracts is dependent on its chemic form (Berlin 1979). Mercury vapor is very efficiently absorbed from the lungs, while elemental mercury is poorly absorbed from the gut (Bhamra and Costa 1992). After gastrointestinal absorption, elemental mercury is oxidized to a divalent form which accumulates mainly in the kidney and in part in the lung. Divalent mercury does not traverse the blood brain barrier as readily as mercury vapor. Inorganic mercury will also accumulate in the intestinal tract, skin, spleen, and testes, but to lesser degrees (Bhamra and Costa 1992). Elimination of mercury vapor is primarily by exhalation, with an estimated biological half-time of approximately 60 days (Hurst et al. 1976; Rohala et al. 1973), while mercury sequestered in the brain may take several years for a halving of retained mercury (Rossi et al. 1976). Divalent mercury, with an estimated biological half-time of 42 days, is primarily excreted in the urine and feces (Rohala et al. 1973).

Metabolism

Inorganic mercury is not known to be metabolized or biotransformed, and behavior within the body would be essentially limited to absorption, distribution, potential sequestration, and excretion.

Toxicity Values

The CalEPA has established an oral reference dose of 1.6×10^{-4} for elemental mercury. In addition, the USEPA has established an oral reference dose for methylmercury of 1×10^{-4} mg/kg-day (USEPA 2010). For this HHRA toxicity values for methylmercury are used due to higher toxicity, and the major pathway for human exposure to methylmercury is consumption of contaminated fish (USEPA 2001).

References

Berlin, M. 1979. Mercury. In L. Friberg, G.F. Nordberg, and V.B. Vouk, Eds. *Handbook on the Toxicology of Metals*. Elsevier/North-Holland, Amsterdam, New York.

Bhamra, R.V., and M. Costa. 1992. Trace elements: Aluminum, arsenic, cadmium, mercury, and nickel. In M. Lippman, Ed. *Environmental Toxicants: Human Exposures and Their Health Effects*. Van Nostrand Reinhold, New York.

Druckrey, H., H. Hamperl, and D. Schmahl. 1957. Carcinogenic action of metallic mercury after intraperitoneal administration in rats. *Z. Krebs-forsch.* 61: 511-519.

Hammond, P.B., and R.P. Beliles. 1980. Metals. In J. Doull, C.D. Klaassen, and M.O. Amdur, Eds. *Casarett and Doull's Toxicology: The Basic Science of Poisons*, 2nd edition. Macmillan, New York.

Hurst, J.B., T.W. Clarkson, M.G. Cherian, J.V. Vostal, and R.V. Mallie. 1976. Clearance of mercury (^{197}Hg, ^{203}Hg) vapor inhaled by human subjects. *Arch. Environ. Health* 31: 302-309.

Mabille, V., H. Roels, P. Jacquet, A. Leonard, and R. Lauwerys. 1984. Cytogenetic examination of leucocytes of workers exposed to mercury vapor. *Int. Arch. Occup. Environ. Health* 53: 257-260.

Matheson, D.S., T.W. Clarkson, and E.W. Gelfand. 1980. Mercury toxicity (acordynia) induced by long-term injection of gamma globulin. *J. Pediatr*. 97: 153-155.

Mitsumori, K., K. Maita, T. Saito, S. Tsuda, and Y. Shikasu. 1981. Carcinogenicity of methylmercury chloride in ICR mice: Preliminary note on renal carcinogens. *Cancer Lett*. 12: 305-310.

Popescu, H.I., L. Negru, and I. Lancrangan. 1979. Chromosome aberrations induced by occupational exposure to mercury. *Arch. Environ. Health* 24(6): 461-463.

Rohala, T., A. Korolainen, and J.K. Miettinen. 1973. Elimination of free and protein-bound ionic mercury ($^{203}Hg^{2+}$) in man. *Ann. Clin. Res*. 5: 214-219.

Rossi, L.S., G.F. Clemente, and G. Santaroni. 1976. Mercury and selenium distribution in a defined area and in its population. *Arch. Environ. Health* 31: 160-165.

Skerfving, S., and J. Vostal. 1972. Symptoms and signs of intoxication. In L. Friberg and J. Vostal, Eds. *Mercury in the Environment: Toxicological and Epidemiological Appraisal*. Chemical Rubber Co., Cleveland, Ohio.

USEPA (U.S. Environmental Protection Agency). 1987. Summary report. In *Peer Review Workshop on Mercury Issues, October 26-27*. EPA Environmental Criteria and Assessment Office, Cincinnati.

USEPA (U.S. Environmental Protection Agency). 2001. *Water Quality Criterion for the Protection of Human Health: Methylmercury*. Office of Science and Technology, Office of Water. EPA-823-R-01-001. Final. January.

USEPA (U.S. Environmental Protection Agency). 2010. IRIS (Integrated Risk Information System) database maintained on the Internet at http://www.epa.gov/iris by EPA Environmental Criteria and Assessment Office, Cincinnati.

METHYLNAPHTHALENE (1,1 and 1,2) AND NAPTHALENE

Napthalene ($C_{10}H_8$, CAS Reference #: 91-20-3) is a white solid that is more commonly known as mothballs. Naphthalene evaporates easily and burns in vapor form, which is generated by solid evaporation, the burning of wood or tobacco, or though industrial processes. Commercially, naphthalene is used in the production of PVC's as well as the more traditional use as a moth repellent and deodorizer. Naphthalene dissolves into water and can bind weakly to sediments allowing it to pass into the groundwater.

1-Methylnaphthalene is a naphthalene-related compound which is also called alpha methylnaphthalene. It is a clear liquid. Its taste and odor have not been described, but you can smell it in water when only 7.5 ppb are present.

Cancer

Naphthalene is classified as a group C, possible human carcinogen (USEPA 2010). While there is inadequate evidence to classify it as a carcinogen, there is suggestive evidence that it increases the incidence of respiratory tract tumors. The mechanism for the occurrence of these tumors is currently unknown (USEPA 2010).

Systemic Toxicity

One of the most common effects of exposure to naphthalene is the development of Hemolytic anemia. Hemolytic anemia causes lowered hemoglobin, hematocrit, and erythrocyte values; elevated reticulocyte counts; Heinz bodies; elevated serum bilirubin; and fragmentation of erythrocytes (USEPA 1998). Exposure to vapors in the form of medication, skin contact, transplacental exposure, and vapor exposure from mothballs have all been shown to induce this anemia (Hanssler, 1964; Irle, 1964; Anziulewicz et al., 1959; Linick, 1983; Cock, 1957; Dawson et al., 1958; Grigor et al., 1966; Naiman and Kosoy, 1964; Schafer, 1951; Valaes et al., 1963;Younis et al., 1957) Cataracts and/or blindness have been known to develop after a single exposure to naphthalene (Lezenius, 1902) as well as chronic exposure to naphthalene (Ghetti and Mariani, 1956)

Deaths from naphthalene have primarily involved intentional ingestion of materials containing naphthalene such as mothballs (Gupta et al., 1979; Kurz, 1987). In one case, poisoning with naphthalene can cause congestion, edema, and bleeding into the lungs (Ijiri et al., 1987) although the symptoms are not confirmed.

Animal studies have shown the development of Hemolytic anemia following exposure to naphthalene in dogs (Zuelzer and Apt, 1949). There have been no other findings of anemia in other animal species. Cataracts were observed in rabbits (Van Heyningen and Pirie, 1967, 1976; Van Heyningen, 1979) rats (Fitzhugh and Buschke, 1949) in both oral dose and gavage studies.

Toxicity of naphthalene in animals was observed in a dose response study of prolonged gavage exposure of naphthalene to rats (BCL 1980). Rats of both sexes displayed diarrhea, lethargy, hunched posture, and rough coats at intermittent intervals throughout the study. Over the course of treatment body weight decreased and lesions formed on kidneys and thymuses. Mice were exposed

to naphthalene vapors for a 103 weeks (NTP, 1992). Exposure increased survivability of mice due to the tendency for the subjects to avoi
d fighting and huddle in cage corners during treatment. Exposure symptoms included inflammation of the olfactory epithelium and hyperplasia of the respiratory epithelium in all exposed mice. Lesions were observed throughout the respiratory system and attributed to repeated inflammatory and regenerative processes.

Toxicokinetics

Naphthalene can be absorbed through ingestion, inhalation, and dermal contact (USEPA 1987). Following absorption, naphthalene is transported throughout the body. Studies of pigs, chickens and cows indicated that concentrations become highest in lung, liver, kidneys, heart, and spleen one month following treatment (Eisele, 1985).

Metabolism

Naphthalene is metabolized into 1,2-napthalene oxide by the liver, eyes, lungs, and in other organs to a lesser extent (Wells et al., 1989; Xu et al., 1992; Buckpitt and Franklin, 1989). Derivatives of 1,2-napthalene oxide, which are formed throughout the body, can cause a variety of symptoms including the formation of cataracts in rats and rabbits (Xu et al., 1992). Naphthalene is eliminated from the body primarily through urine

Toxicity Values

The USEPA has established an RfD for naphthalene of 0.02 mg/kg-day (USEPA 2010) based on a NOAEL of 71 mg/kg-day for decrease terminal body weight in male rats observed in a subchronic oral rat study (BCL 1980) with application of an uncertainty factor of 3000 (10 to extrapolate from rats to humans, 10 to protect sensitive humans, 10 to extrapolate from subchronic to chronic exposure, and 3 for database deficiencies including the lack of chronic oral exposure studies and 2-generation reproductive toxicity studies).

The ATSDR has established a minimal risk level (MRL) for 1-methylnapthalene of 0.07 mg/kg-day (ATSDR) based on a LOAEL of 71 mg/kg-day for increased incidences of pulmonary alveolar proteinosis with application of an uncertainty factor of 1000 (10 for using a LOAEL, 10 for extrapolating from animals to humans, and 10 for human variability) (ATSDR 2005).

The USEPA has established an RfD for 2-methylnapthalene of 0.004 mg/kg-day (USEPA 2010) based on a LOAEL of 71 mg/kg-day for increased incidences of pulmonary alveolar proteinosis with application of an uncertainty factor of 1000 (10 for using a LOAEL, 10 for extrapolating from animals to humans, and 10 for human variability).

The USEPA has established an oral slope factor of 2.9×10^{-2} for 1-methylnaphthalene based on significantly increased incidences of lung adenomas or carcinomas (USEPA 2008). 1-methylnaphthalene was identified as “Suggestive Evidence of Carcinogenicity” (USEPA 2008).

References

ATSDR (Agency for Toxic Substances and Disease Registry). 2005. *Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene*. U.S. Department of Health and Human Services, Public Health Service. August.

Anziulewicz, JA; Dick, HJ; Chiarulli, EE. (1959) Transplacental naphthalene poisoning. Am J Obstet Gynecol 78:519-521.

Battelle's Columbus Laboratories (BCL). (1980) Unpublished subchronic toxicity study: Naphthalene (C52904), Fischer 344 rats. Prepared by Battelle Laboratories under NTP Subcontract No. 76-34-106002. Available from the Center for Environmental Research Information, (202)566-1676.

Buckpitt, AR; Franklin, RB. (1989) Relationship of naphthalene and 2-methylnaphthalene metabolism to pulmonary bronchiolar epithelial cell necrosis. Pharm Ther 41:393-410.

Cock, TC. (1957) Acute hemolytic anemia in the neonatal period. Am J Dis Child 94:77-79.

Dawson, JP; Thayer, WW; Desforges, JF. (1958) Acute hemolytic anemia in the newborn infant due to naphthalene poisoning: report of two cases, with investigations into the mechanism of the disease. Blood 13:1113-1125.

Eisele, GR. (1985) Naphthalene distribution in tissues of laying pullets, swine, dairy cattle. Bull Environ Contam Toxicol 34:549-556.

Fitzhugh, OG; Buschke, WH. (1949) Production of cataract in rats by beta-tetralol and other derivatives of naphthalene. Arch Opthalmol 41:572-582.

Ghetti, G; Mariani, L. (1956) Alterazioni oculari da naftalina. Med Lavoro 47(10):533-538. (Ital.)

Grigor, WG; Robin, H; Harley, JD. (1966) An Australian variant on “full-moon disease.” Med J Aust 2:1229-1230.

Hanssler, H. (1964) Lebensbedrohliche naphtalinvergiftung bei einem saeugling durch vaporindampfe [Life-threatening naphthalene intoxication of an infant through vapor in fumes]. Dtsch Med Wochenschr 89:1794-1797.

Ijiri, I; Shimosato, K; Ohmae, M; et al. (1987) A case report of death from naphthalene poisoning. Jpn J Legal Med 41(1):52-55.

Irle, U. (1964) Akute haemolytische anaemie durch naphthalin-inhalation bei zwei fruehgeborenen und einem neugeborenen [Acute hemolytic anemia caused by naphthalene inhalation in two premature babies and one neonate]. Dtsch Med Wochenschr 89:1798-1800.

Kurz, JM. (1987) Naphthalene poisoning: critical care nursing techniques. Dimens Crit Care Nurs 6:264-270.

Lezenius, A. (1902) Ein fall von naphthalincataract am menschen. Monatablatter für Augenheikunde 40:129-141. (Ger.)

Linick, M. (1983) Illness associated with exposure to naphthalene in mothballs—Indiana. MMWR 32:34-35.

Naiman, JL; Kosoy, MH. (1964) Red cell glucose-6-phosphate dehydrogenase deficiency—a newly recognized cause of neonatal jaundice and kernicterus in Canada. Can Med Assoc J 91(24):1243-1249.

NTP. (199a) Toxicology and carcinogenesis studies of naphthalene (CAS no. 91-20-3) in B6C3F1 mice (inhalation studies). U.S. Department of Health and Human Services, National Institutes of Health, Rockville, MD. Technical report series no. 410. NIH pub. no. 92-3141.

Schafer, WB. (1951) Acute hemolytic anemia related to naphthalene: report of a case in a newborn infant. Pediatrics 7:172-174.

USEPA (U.S. Environmental Protection Agency). 2010. IRIS (Integrated Risk Information System) database maintained on the Internet at http://www.epa.gov/iris by EPA Office of Research and Development, National Center for Environmental Assessment, Cincinnati.

USEPA. 2008. *Provisional Peer Reviewed Toxicity Values for 1-Methylnaphthalene (CASRN 90-12-0)*. Superfund Health Risk Technical Support Center, National Center for Environmental Assessment. January 10.

USEPA. 1987. Summary review of health effects associated with naphthalene. Health issue assessment. Office of Health and Environmental Assessment, Washington, DC. EPA/600/8-87/055F.

Valaes, T; Doxiadis, SA; Fessas, P. (1963) Acute hemolysis due to naphthalene inhalation. J Pediatr 63:904-915.

Van Heyningen, R. (1979) Naphthalene cataract in rats and rabbits: a résumé. Exp Eye Res 28:435-439.

Van Heyningen, R; Pirie, A. (1967) The metabolism of naphthalene and its toxic effect on the eye. Biochem J 102:842-852.

Van Heyningen, R; Pirie, A. (1976) Naphthalene cataract in pigmented and albino rabbits. Exp Eye Res 22:393-394.

Wells, PG; Wilson, B; Lubek, BM. (1989) *In vivo* murine studies on the biochemical mechanism of naphthalene cataractogenesis. Toxicol Appl Pharmacol 99(3):466-473.

Xu, G-T; Zigler, JS; Lou, MF. (1992) The possible mechanism of naphthalene cataract in rat and its prevention by an aldose reductase inhibitor (ALN1576). Exp Eye Res 54:63-72.

Younis, D; Platakos, TH; Veltsos, A; et al. (1957) Intoxication de l'homme par voie aerienne due a la naphtaline. Etude clinique et experimentale [Clinical and laboratory study of cases of naphthalene intoxication.] Arch Inst Pasteur Hell 3:62-67. (Cited in U.S. EPA, 1987b)

Zuelzer, WW; Apt, L. (1949) Acute hemolytic anemia due to naphthalene poisoning: a clinical and experimental study. J Am Med Assoc 141(3):185-190.

POLYNUCLER AROMATIC HYDROCARBONS (PAHs)
(including Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene, and Indeno(1,2,3-cd)pyrene)

PAHs are a group of chemicals that are formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAHs (ATSDR, 1995). PAHs generally occur as complex mixtures (for example, as part of combustion products such as soot), not as single compounds. PAHs usually occur naturally, but they can be manufactured as individual compounds for research purposes; however, not as the mixtures found in combustion products. As pure chemicals, PAHs generally exist as colorless, white, or pale yellow-green solids. They can have a faint, pleasant odor. A few PAHs are used in medicines and to make dyes, plastics, and pesticides. Others are contained in asphalt used in road construction. They can also be found in substances such as crude oil, coal, coal tar pitch, creosote, and roofing tar.

Although the health effects of individual PAHs are not exactly alike they are considered as a group for this toxicological profile.

Systemic Effects

Aside from one study, reports of subchronic and chronic systemic toxicity of PAHs by any route have not been found (ATSDR, 1995). Workers in a rubber factory with measured exposures to benzo(a)pyrene and total suspended particulate matter were monitored for respiratory health (Gupta et al., 1993). Long-term employees had statistically significant loss of ventilatory function; those with highest exposures exhibited patch opacities in the lungs, prominent bronchiovascular markings, and pleural effusions, along with bloody vomit, breathing problems, chest pains, lung and throat irritation, and cough. Workers in other parts of the plant were similarly affected to a lesser degree. No attempt was made to separate the effects of exposure to benzo(a)pyrene and particulates, or to identify other potentially toxic air pollutants at the plant. Other human occupational studies (Assenato et al., 1993; Santella et al., 1993) seeking markers of BaP exposure experienced similar problems of confounding and revealed trends, but could not establish statistically significant effects. Wolff et al. (1989) tested 40 male and 40 female Fischer-344 Crl rats with nose-only exposures to a 7.7-mg/m^3 aerosol of benzo(a)pyrene 2 hrs/day, 5 days/week for 4 weeks, and found no treatment-related lesions in the lungs or nasal cavities; but no dose-response relationship could be established with this single-level study, and the rest of the respiratory tract was not examined. A few other research studies have explored some systemic pathologic endpoints in a few animals exposed either by ingestion or inhalation (Nousiainen et al., 1984; Robinson et al., 1975; Thyssen et al., 1981). However, the findings of these investigations are also judged inadequate to estimate the risks of this compound for exposed humans.

Carcinogenicity

The carcinogenicity of benzo(a)pyrene and the other PAHs has been classified as Category B2 by USEPA (2010). The effects of this chemical by skin contact, ingestion, and inhalation have been investigated. Epidemiology studies have demonstrated increased mortality due to lung

cancer in humans exposed via inhalation to coke-oven emissions (Lloyd, 1971; Mazumdar et al., 1975; Redmond et al., 1976), roofing tar emissions (Hammond et al., 1976), and cigarette smoke (McLure and MacMahon, 1980). Reports of skin tumors among individuals exposed to mixtures containing PAHs have also been documented (e.g., Purde and Etlin, 1980). Each of these mixtures contained a number of PAHs including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, dibenz(a,h)anthracene, as well as other potentially carcinogenic chemicals including nitrosamines, coal tar pitch, and creosote. Evaluating the contribution of any individual PAH to the total carcinogenicity of these mixtures in humans is not possible, because of the complexity of the mixtures and the presence of other carcinogens. Thus, epidemiologic evidence in humans regarding the potential carcinogenicity of benzo(a)pyrene alone is inadequate.

Experimental studies in laboratory animals have shown that repeated administration of benzo(a)-pyrene by any route is associated with an increased incidence of tumors. It is tumorigenic in animals via dietary administration, gavage, inhalation, intratracheal instillation, and dermal and subcutaneous applications (USEPA 2010). Mice administered daily dietary doses of up to 1000 ppm benzo(a)pyrene for 38 to 238 days exhibited an increased incidence of stomach tumors (Rigdon and Neal, 1966). Benzo(a)pyrene induces skin tumors in mice at the point of contact with repeated dermal application (Shubik and della Porta, 1957). An inhalation study by Thyssen et al. (1981) showed that repeated exposure to benzo(a)pyrene particles induced respiratory tract tumors in Syrian golden hamsters. Benzo(a)pyrene is mutagenic in the Ames assay and in prokaryote and mammalian cell culture tests for DNA damage (USEPA 2010), providing supporting data for its possible mechanism of action as an initiator of tumorigenesis.

Benzo(a)pyrene appears to be a developmental and reproductive toxicant when administered at high doses by ingestion to pregnant mice (MacKenzie and Angevine, 1981; Rigdon and Neal, 1965) and rats (Rigdon and Rennels, 1964), although results are inconsistent among studies. In addition, the findings may be of questionable relevance to humans, since the doses administered appear to have induced maternal toxicity (MacKenzie and Angevine, 1981; Shevaleva, 1978; Rigdon and Neal, 1965).

Among the carcinogenic PAHs, benzo(a)pyrene has been the most widely studied, and is considered by some to be the most potent, although sometimes dibenz(a,h)anthracene is also acknowledged as being of similar potency. Therefore, the toxicity of benzo(a)pyrene was chosen as the relative standard against which the carcinogenic potential of other PAHs in this study were considered, and then applied to the quantitative assessment of their risk.

Toxicity Values

No toxicity values for health effects other than cancer have been derived for PAHs identified in this HHRA (USEPA 2010).

Carcinogenic PAHs appear to exert their effects mainly at the point of contact (dermal application results in skin tumors), or portal of entry (ingestion results mainly in forestomach tumors. Inhalation results in respiratory tract tumors and tumors of the upper digestive tract presumably due to mucociliary particle clearance and involuntary ingestion of particles).

Tumors distant from the point of application have also been observed. Among the PAHs, benzo(a)pyrene (BaP) has the ability to elicit cancer, and it is the most potent carcinogen.

For ingestion of BaP, a SF of 7.3 $(mg/kg\text{-}day)^{-1}$ was estimated by USEPA (2010). This SF is the geometric mean of four slopes (ranging from 4.5 to 11.7 $(mg/kg\text{-}day)^{-1}$) derived by different modeling procedures from the studies of Neal and Rigdon (1967), Rabstein et al. (1973), and Brune et al. (1981).

Few studies have evaluated the carcinogenic effects of inhalation exposure to BaP. The predominant sources of airborne benzo[*a*]pyrene (BaP) are combustion processes. Thus, this compound rarely enters the environment alone but rather is associated with additional PAHs and other components frequently present in both vapor phase and particulate form. Available epidemiological information, therefore, is from persons exposed to mixtures such as tobacco smoke, diesel exhaust, air pollutants, synthetic fuels, or other similar materials (CalEPA 2009).

Potency estimates for inhalation carcinogenicity were derived by CalEPA (2009) from gastric tumors (papillomas and squamous cell carcinomas) observed in male and female mice due to feeding of BaP (Neal and Rigdon, 1967), respiratory tract tumors in hamsters from the inhalation bioassay of Thyssen *et al.* (1981), and from data obtained after intratracheal administration of BaP (Saffiotti *et al.*, 1972; Feron *et al.*, 1973).

An inhalation unit risk for benzo(a)pyrene, developed by CalEPA, is .0011 $(ug/m^3)^{-1}$ based upon exposure to male Syrian golden hamsters to BaP condensed onto sodium chloride particles at BaP concentrations of 2.2, 9.5, and 46.5 mg BaP/m3. Tumors were not observed in the respiratory tract of the unexposed control group or the group that received 2.2 mg/m3. The incidence of tumors in this organ system increased in a dose dependent manner for the 9.5 and 46.5 mg/m3 exposure groups. Papillomas, papillary polyps, and squamous cell carcinomas were seen in the nasal cavity, larynx, trachea, pharynx, esophagus, and forestomach. Lung tumors were absent (Thyssen et al, 1981).

References

Assennato, G., G.M. Ferri, V. Foa, et al. 1993. Correlation between PAH airborne concentration and PAH-DNA adduct levels in coke-oven workers. *Int. Arch. Occup. Environ. Health* 65:S143-S145.

ATSDR. 1995. *Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs). Update.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta. August.

Brune, H., R.P. Deutsch-Wenzel, M. Habs, S. Ivankovic, and D. Schmahl. 1981. Investigation of the tumorigenic response to benzo[*a*]pyrene in aqueous caffeine solution applied orally to Sprague-Dawley rats. *J. Cancer Res. Clin. Oncol.* 102(2): 153-157.

CalEPA. 2009. *Air Toxics Hot Spots Risk Assessment Guidelines Part II: Technical Support Document for Cancer Potency Factors*. Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Branch. May.

Feron VJ, de Jong D and Emmelot P. 1973. *Dose-Response Correlation for the Induction of Respiratory-Tract Tumours in Syrian Golden Hamsters by Intratracheal Instillations of Benzo(a)pyrene*. Eur J Cancer 9:387-390.

Gupta, P., D.K. Bannerjee, S.K. Bhargava, et al. 1993. Prevalence of impaired lung function in rubber manufacturing factory workers exposed to benzo(a)pyrene and respirable particulate matter. *Indoor Environ.* 2: 26-31.

Hammond, E.D., I.J. Selikoff, P.O. Lawther, and H. Seidman. 1976. Inhalation of B[a]P and cancer in man. *Ann. N.Y. Acad. Sci.* 271: 116-124.

Heinrich, U., F. Pott, U. Mohr, R. Fuhst, and J. Koenig. 1986. Lung tumors in rats and mice after inhalation of polycyclic aromatic hydrocarbon-rich emissions. *Exp. Pathol.* 29: 29-34.

Lloyd, J.W. 1971. Long-term mortality study of steelworkers. V. Respiratory cancer in coke plant workers. *J. Occup. Med.* 13: 53-68.

MacKenzie, K.M., and D.M. Angevine. 1981. Infertility in mice exposed in utero to benzo[*a*]pyrene. *Biol. Reprod.* 24: 183-191.

Mazumdar, S., C.K. Redmond, W. Sollecito, and N. Sussman. 1975. An epidemiological study of exposure to coal tar pitch volatiles among coke oven workers. *J. Air Pollut. Control Assoc.* 25: 382-389.

McLure, K.M., and B. MacMahon. 1980. An epidemiologic perspective of environmental carcinogenesis. *Epidemiol. Rev.* 2: 19-48.

Neal, J., and R.H. Rigdon. 1967. Gastric tumors in mice fed benzo[*a*]pyrene: A quantitative study. *Tex. Rep. Biol. Med.* 25: 553-557.

Nousiainen, U., R. Torronen, and O. Hänninen. 1984. Differential induction of various carboxylesterases by certain polycyclic aromatic hydrocarbons in the rat. *Toxicology* 32: 243-251.

Purde, M., and S. Etlin. 1980. Cancer cases among workers in the Estonia oil shale processing industry. Pp. 527-528 in *Health Implications of New Energy Technologies.* Ann Arbor Science, Ann Arbor, Michigan.

Rabstein, L.S., R.L. Peters, and G.J. Spahn, 1973. Spontaneous tumors and pathologic lesions in SWR/R mice. *J. Natl. Cancer Inst.* 50: 751-758.Redmond, E., B. Strobino, and R. Cypress.

1976. Cancer experience among coke by-product workers. *Ann. N.Y. Acad. Sci.* 2-7: 102-115.

Rigdon, R.H., and J. Neal. 1965. Effects of feeding benzo[*a*]pyrene on fertility, embryos, and young mice. *J. Nat. Cancer Inst.* 34: 297-305.

Rigdon, R.H., and J. Neal. 1966. Gastric carcinomas and pulmonary adenomas in mice fed benzo[a]pyrene. *Tex. Rep. Biol. Med.* 24: 195-207.

Rigdon, R.H., and E.G. Rennels, 1964. Effect of feeding benzpyrene on reproduction in the rat. *Experimentia* 20: 224-226.

Robinson, J.R., J.S. Felton, R.C. Levitt, et al. 1975. Relationship between "aromatic hydrocarbon responsiveness" and the survival times in mice treated with various drugs and environmental compounds. *Mol. Pharmacol.* 11:850-865.

Saffiotti U, Montesano R, Sellakumar AR and Kaufman DG. 1972. *Respiratory tract carcinogenesis induced in hamsters by different dose levels of benzo[a]pyrene and ferric oxide*. J Natl Cancer Inst 49:1199-1204.

Santella, R.M., K. Hemminki, D.-L. Tang, et al. 1993. Polycyclic aromatic hydrocarbon-DNA adducts in white blood cells and urinary 1-hydroxypyrene in foundry workers. *Cancer Epidemiol. Biomark. Prev.* 2: 59-62.

Shevaleva, G.A. 1978. On the effect of 3,4-benzpyrene on the development of the fetus applied at different stages of gestation. *Gig. Tr. Prof. Zabol.* 7: 54.

Thyssen, J., J.K.G. Althoff, and U. Mohr. 1981. Inhalation studies with benzo[*a*]pyrene in Syrian golden hamsters. *J. Nat. Cancer Inst.* 66: 575-577.

USEPA. 1989. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) (Interim Final).* Report No. EPA/540/1-89002. USEPA Office of Emergency and Remedial Response, Washington, DC.

USEPA, 2010. Integrated Risk Information System (IRIS) database maintained on the Internet at http://www.epa.gov/iris. USEPA Environmental Criteria and Assessment Office, Cincinnati.

Wolff, R.K., W.C. Griffith, R.F. Henderson, et al., 1989. Effects of repeated inhalation exposures to 1-nitropyrene, benzo(a)pyrene, Ga_2O_3 particles, and SO_2 alone and in combinations on partical clearance, bronchoalveolar lavage fluid composition, and histopathology. *J. Toxicol. Environ. Health* 27(1): 12-138.

2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN (DIOXIN, OR TCDD)

2,3,7,8-tetrachlorodibenzo-*p*-dioxin ($C_{12}H_4Cl_{14}O_2$; CAS Registry No. 1746-01-6) is a white to colorless crystalline solid that is ubiquitous in the environment.

Cancer

TCDD, or dioxin, is a probable human carcinogen (Group B2), based on observations of increased soft tissue sarcoma and lymphomas in populations exposed primarily via contact with herbicides contaminated with 2,3,7,8-TCDD (USEPA 1997). ATSDR (1998) summarized the epidemiological data as providing limited evidence that exposure to phenoxyacetic acid herbicides and/or chlorophenols is causally related to the risks of soft tissue sarcoma, but none of the data sufficed to implicate 2,3,7,8-TCDD alone. Animal carcinogenicity studies were related to dermal exposure, and indicated skin tumors resulted from application to female Swiss mice. Mixed results were obtained regarding the promoter-like potential of dioxin.

Mutagenicity

Genotoxicity of dioxin has been reported as mixed results in both humans and animals. Humans exposed to chemicals contaminated with dioxin (herbicide production workers) were reported to have increased chromosomal aberrations in peripheral lymphocytes, while soldiers exposed to Agent Orange had no such increases. Animal studies seem to indicate that while there is evidence of genotoxic and mutagenic effects, more definitive, confirmatory studies are required (ATSDR 1998).

Systemic Toxicity

Effects following dioxin exposure via the oral route have been well-studied in animals, and to a lesser extent in humans. With a variety of relevant experimental durations (i.e., subchronic or chronic; from >14 days to >1 year), adverse effects from dioxin were expressed predominantly as decreased longevity, as well as reproductive, immunological, and hepatic effects (ATSDR 1998). In general, for exposures of 15 days to 1 year, most of the animal NOAELs for these effects occur at ingestion of dioxins ranging from approximately 0.001 (longevity and liver effects) to 0.01 ug/kg/day (immunotoxicity), with no human NOAELS. Animal LOAELs ranged from 0.001 ug/kg/day (reproductive, liver effects) to 0.01 ug/kg/day (immunotoxicity), with no human LOAELs. For exposures of 1 year or longer, only an animal NOAEL of 0.001 ug/kg/day for liver toxicity was observed, with no human NOAELs or LOAELs.

One study evaluated the response of nude mouse skin to subchronic application. Application of approximately 5 ug/kg/day resulted in chloracne (facial and upper body skin lesions). This effect has been observed mostly in humans, although quantitative dose levels have not been determined. A human minimum toxic effect dose of 0.1 ug/kg was estimated (using non-human primate data and applying human data extrapolated from ingestion of PCB- and DBF-contaminated rice oil to dioxin dose data).

Toxicokinetics

The absorption of dioxin is most dependent on the vehicle of administration, such as in an oil base or in the diet, and factors determined from animal studies. After oral ingestion in an oil vehicle, absorption ranges from 50 to 80 percent, while in the diet, it is between 50 and 60 percent. Dermal absorption was to a much more limited extent, although it was also highly affected by the vehicle. Dermal absorption in rats has ranged from 40 percent (in methanol) to less than 2 percent (a soil paste or activated carbon). Data were not available for inhalation absorption. Once absorbed, dioxin appears to be distributed through the body via the lymphatic system (in rats), and concentrates in liver and fatty tissue. The average half life of dioxin in humans was estimated at approximately 7 years, although half lives as long as 27 years were also estimated (ATSDR 1998).

Metabolism

The primary metabolic processes following dioxin exposure involve the attachment of hydroxyl groups onto the parent compound or the substitution of a hydroxyl group for a chlorine atom. Although dioxin is not rapidly metabolized, once metabolites form, they are eliminated fairly rapidly as conjugates with glucuronide and sulfates. Metabolites are thought to be less toxic than dioxin itself, and it has been suggested that the rates of metabolism, as well as the types of metabolites may account for differential effects observed in several species (ATSDR 1998).

Toxicity Values

The ATSDR has identified a minimal risk level of $1x10^{-9}$ for 2,3,7,8-TCDD based a LOAEL of 1.2×10^{-4} μg/kg/day identified for neurobehavioral effects (ATSDR 1998).

The CalEPA has proposed an oral SF of $1.3 \text{ x } 10^{5}$ $(\text{mg/kg-day})^{-1}$ for TCDD (CalEPA 2009). An interim approach for extrapolating TCDD toxicity values for use with various isomers exhibiting fractional toxicities relative to 2,3,7,8-TCDD (i.e., use of toxicity equivalence factors) has been developed (USEPA 1994). The critical study found the induction of cancer in the male mouse with hepatocellular adenomas or carcinomas (NTP 1982).

References

ATSDR (Agency for Toxic Substance and Disease Registry). 1998 *Toxicologial Profile for Chlorinated Dibenzo-p-Dioxins.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta, Georgia. December.

NTP (National Toxicology Program). 1982. *Bioassay of 2,3,7,8-tetrachlorodibenzo-p-dioxin for possible carcinogenicity (dermal).* DHHS Publ No. (NIH) 80-1757. Carcinogenesis Testing Program, National Cancer Institute, Bethesda, MD, and National Toxicology Program, Research Triangle Park, NC. [as cited in ATSDR 1998].

USEPA (U.S. Environmental Protection Agency). 1994. *Estimating Exposures to Dioxin-Like Compounds Volume III: Site-Specific Assessment Procedures (External Review Draft).* Report No. EPA/600/6-88/005C. EPA Office of Research and Development, Washington, DC. June.

Polychlorinated Biphenols (PCBs)

Polychlorinated biphenyls (PCBs) are a family of related, man-made chemicals, with 209 possible congeners of the base biphenyl molecule. Only about 130 have been identified in commercial mixtures and residues (Hansen 1987a). Due to their protracted environmental and biological persistence, the potential for exposure to PCBs remains; in addition, transformers manufactured in the 1970's are presently reaching the end of their usefulness and are being discarded. Human exposure is through food and drinking water, inhalation of contaminated air, and dermal contact at waste sites.

A great deal of information has been accumulated about the toxicity of PCBs in humans due to two accidental exposures to relatively large human population groups, as well as numerous occupational exposure studies. The persistence of PCBs in the environment has led to a large body of data on the field and laboratory toxicity of PCBs to ecological receptors.

Carcinogenicity

USEPA's cancer evaluation of Aroclor 1248 and 1260 is incomplete; PCBs in general are classified by both USEPA and IARC as Category B2 carcinogens, based on sufficient animal data and inadequate human data (USEPA 2010; IARC 1987). Although a fair amount of human epidemiological data exists, no one study is adequate for purposes of carcinogenic classification; thus, USEPA’s slope factor (SF) is based on an oral feeding study by Norback and Weltman (1985) in rats. However, the World Health Organization (WHO) has concluded that the complication of co-contamination of PCB mixtures by polychlorinated dibenzofurans (PCDFs) limits any conclusion about purely PCB tumor promotion (IPCS 1993).

Human evidence from general population and occupational epidemiologic studies indicates that exposure to polychlorinated biphenyls (PCBs) can result in cancers of the liver, gastrointestinal tract, gall bladder, and respiratory tract. However, no single study satisfies enough of the necessary experimental design and/or statistical criteria in order for a definitive determination to be made. In addition, in none of the studies were the exposures restricted to a single Aroclor mixture without known or suspected PCDF co-contamination present, and none of the PCB congeners were identified.

USEPA (USEPA 2010) and IARC (1987) have determined that the limited experimental animal data available on the potential carcinogenicity of PCBs (Nagasaki et al. 1972, Kimbrough et al. 1972, 1975, Allen and Norback 1973, Norback and Weltman 1985) provide sufficient evidence of carcinogenicity in animals. Several major limitations reduce the strength of most of these studies, however. First, all utilized mixtures (Aroclor, Kanechlor, Clophen) without analytical specification of the PCB congeners present, so that no control measures were established for the well-known variability of PCB components across batches and mixtures. Second, metabolic activation of hepatic microsomal monooxygenases by PCBs is higher in females than males and higher in the young than in adult members of the species tested. This bias in the age and sex of the animals was also not tested against controls. Thirdly, the amount of PCDF co-contamination of the PCB mixtures was neither specified nor compared with controls.

IPCS believed that, while the role of PCBs as tumor promoters in animals was substantially evident, the complication of PCDF co-contamination remains a major limitation to any conclusion about PCB tumor promotion per se.

Mutagenicity

PCBs have been shown to interact with RNA and DNA after metabolic activation (IARC 1987, citing Stadnicki et al. 1979; Wong et al. 1979). DNA-breaking activity has been demonstrated in vivo in rat hepatocytes (Robbiano and Pino 1981). With few exceptions, various Aroclor mixtures have been demonstrated to be non-mutagenic to various strains of *Salmonella typhimurium* in several assays, both with and without metabolic activation (IPCS 1993). The majority of microbial assays of PCB mixtures and various congeners showed no evidence of mutagenic effects (Schoeny et al. 1979; Schoeny 1982; Wyndam et al. 1976). Of several tests on the clastogenic effect of PCBs (Heddle and Bruce 1977; Green et al. 1975), only one (Peakall et al. 1972) reported results indicative of a possible clastogenic action in dove embryos. Since PCBs show tumor-promoting activity in the liver and lung, the evidence suggests that tumor induction occurs primarily through modes of action that do not involve gene mutation.

Systemic Toxicity In Humans

Short-term exposures to PCBs result primarily in dermal and ocular symptoms (IPCS 1993). Skin rashes, burning sensations, irritation, smarting, and sweating are reported within a few hours after exposure. Painful irritation of the ocular conjunctiva is a consistently reported symptom. These symptoms usually diminish some time after removal from the source of PCB exposure. In some cases of very high concentrations (10-16 mg/m^3) with exposures of several hours, a delayed acute reaction sets in with a latency of several weeks to months. These dermal symptoms consist of hyper-pigmentation (especially in the facial area and around the eyes), ridges on the fingernails, and acne vulgaris. These late sequelae can last from months up to several years.

There have been two PCB poisoning events that affected large numbers of people in the general population. One occurred in Japan in 1968 and is called the “Yusho” incident. The second, the “Yu-Cheng” accident, occurred in Taiwan in 1979 (IPCS 1993). Both incidents were due to the contamination of rice bran oil by leaks from heat exchange units during the manufacturing process. The other main source of data on chronic PCB intoxication comes from a series of occupational exposure studies on workers exposed in capacitor manufacturing plants, as well as studies on utility workers and railroad workers.

PCB intoxication in both the Yusho and Yu-Cheng cases initially resulted in hyper-secretion of the Meibomian (tear) glands of the eyes, swelling of the eyelids, hyper-pigmentation of the nails and mucous membranes, fatigue, nausea, and vomiting. These were later followed by hyperkeratosis and darkening of the skin, follicular enlargement and acneform eruptions, chloracne, edema of the extremities, liver enlargement and elevated blood serum triglycerides, bronchitis and other respiratory problems, some central nervous system effects (e.g., numbness of the legs), and suppression of the immune system (i.e., decreases of serum IgA and IgM). Most of the clinical symptoms in adults dissipated over time, with only a few patients still having

extensive chloracne 15 years after the accident (Masuda et al. 1974, Chen et al. 1985, IPCS 1993).

A smaller, but highly exposed, population group is composed of dairy farm families whose silos were coated with PCB-containing cumar and who consumed their own dairy products and meat (Hansen 1987a). The small sample size (n = 12-15) limits any definitive conclusions, but clear correlation was found between blood serum PCB levels and various clinical symptoms. Four cancers were reported (pituitary, cervical, liver, and respiratory adenocarcinoma).

Numerous occupational exposure studies have evaluated chronic workplace exposures to PCBs (Ouw et al. 1976, Baker et al. 1980a, Maroni et al. 1981, Fischbein et al. 1979). Clinical symptoms included dermal burning around the eyes, face and skin, rashes, chloracne, a persistent body odor, liver dysfunction, severe fatigue, severe reduction of libido, chronic skin rashes, leg and joint pains, gastric ulcers, and cancers. A positive correlation was found between blood serum PCB levels and the reporting of dermatological problems. Interestingly, no dermatological problems were found in workers with blood serum PCB levels below 200 ppb. The threshold for liver dysfunction appears to lie between 100 ppb and 200 ppb of PCBs in blood.

Developmental Toxicity

Children born after maternal exposure in the Yusho incident had diminished growth, hyperpigmentation of the skin and mucous membranes, gingival hyperplasia, abnormal calcification of the skull, rocker bottom heel, and a high incidence of low birth weight (IPCS 1993). Those examined six years after birth were shorter, weighed less, and had more frequent abnormalities of the gingiva, skin, nails, teeth, and lungs. They showed delay in developmental milestones, deficits in formal development testing, and abnormalities during behavioral assessment (Rogan et al. 1987). Among nine Yu-Cheng girls, four had congenital absence of permanent teeth germs. Among nine Yu-Cheng boys, one did not (Lan et al. 1989). Kuratsune et al. (1972) followed 42 Yusho children for 3 years after the incident and found that boys had decreased height and weight, as compared to controls, but girls did not.

In studies by Hara (1985), breast-fed children of capacitor workers exposed to Kanechlor 300 and 500 had elevated PCB levels in their blood, and some children who were breast fed the longest had clinical symptoms similar to Yusho children (i.e., itchy skin, eczema, red eyes, fever, colds, etc.).

Several other studies have looked at developmental effects of PCBs. Smith (1984) evaluated 62 babies who were breast-fed and 11 who were bottle-fed. The mothers' blood serum PCB levels were positively correlated with the number and type of infectious illnesses during the first 4 months of life. Gladen et al. (1988) found that higher transplacental exposure to PCBs was associated with lower psychomotor scores at both 6 and 12 months after birth, but this was not seen in breast-fed infants.

Reproductive Toxicity

Wassermann et al. (1982) evaluated the relationship between blood PCB levels and premature deliveries. A significant difference was found between the blood PCB levels in normal versus premature delivery mothers. Splitting the premature deliveries into a low (9/17) and a high (8/17) serum-PCB group demonstrated that the high blood-PCB group had a significantly higher blood PCB level (mean = 128 μg/L) versus the other two groups (premature/low blood PCB = 21.4 mg/L; normal = 19.3 μg/L). In the high-PCB/premature group, the mean serum concentration of tetrachloro-isomers was slightly lower than that of the normal group (0.6 versus 1.86 μg/L), while the pentachloro- and hexachloro-isomers were higher than those of the normal group (78.2 versus 15.7 μg/L and 48.9 versus 1.72 μg/L, respectively).

Taylor et al. (1984, 1989) studied the relation of Aroclor 1016, 1242, and/or 1254 to gestational age and birth weight. A mean birth weight deficit of 153 grams was seen in 39 infants born to mothers working in two capacitor plants, relative to 337 infants from mothers without occupational PCB exposure. A mean gestational age deficit of 6.6 days was also found. Although several critical variables were not controlled for (smoking, alcohol consumption, socioeconomic status), it was concluded that the lower birth rate was due to the shortened gestational period.

Immunotoxicity

Immunological function was found to be impaired in both the Yusho and Yu-Cheng patients (Lu and Wu 1985; Nakanishi et al. 1985). In the Yusho patients, there was an early suppression of IgA and IgM in the blood serum which eventually returned to normal. As with the Yusho patients, the Yu-Cheng patients experienced many types of infections, most frequently in the respiratory tract and skin, and accompanied by decreases in IgA and IgM, but not IgG. There were decreased total T-cells, active T-cells and helper T-cells, suppression of delayed type response to recalling antigens, among other effects. IgA and IgM levels returned to normal within 2 years, even though the respiratory infections continued.

Respiratory System

Except for several cases of persisting chloracne, chronic bronchitis remained the most long-lasting major clinical problem for all of the Yusho and Yu-Cheng patients (Nakanishi et al. 1985). It was found that the PCBs spread evenly throughout the lung parenchyma, and were located preferentially in the Clara cells of the bronchioles. This is now believed to be the result of the biotransformation of certain PCB congeners into methyl sulfone PCB metabolites and the affinity of bronchial peptides for these conjugates (Hansen 1987b). It is these persistently bound PCB metabolites that are presumed to cause the chronic bronchitis in both the general population and occupationally exposed individuals.

Neurotoxicity

Both acute and chronic exposures to PCBs have been reported to cause neurological and nonspecific psychological and/or psychosomatic problems (Hara 1985; Hansen 1987b). These

latter symptoms include headache, dizziness, nausea, depression, loss of energy, sleep and memory problems, nervousness, and impotence. In followup studies of victims of the Yu-Cheng incident, both the sensory and motor nerve conduction velocities were significantly depressed compared to controls (Chen et al. 1985; Chia and Chu 1984).

In Experimental Animals

The acute toxicity of PCBs is generally fairly low, especially in terrestrial organisms. The adverse effects of PCBs vary with the percentage composition of the specific isomers, their stereochemical orientation, the presence of impurities (e.g., PCDFs), the animal species involved, and the route of exposure. In animals, the LD_{50}s increase with increasing chlorination. The young are more sensitive than adults, a factor that has not been adequately addressed in many of the toxicity tests. In rats, the LD_{50}s range from 3980 mg/kg for Aroclor 1221 up to 10,000-11,000 mg/kg for Aroclor 1260 (Fishbein 1974). A typical LD_{50} for the young of a species might range from 1,300-2,500 mg/kg versus 4,000-11,000 mg/kg for an adult. There is also considerable variation within and between species, with the rhesus monkey and guinea pig being very sensitive, the cynomolgus monkey and rabbit next, followed by the rat. In general, rats and fish are less sensitive to the lower chlorinated PCBs, while birds tend to be less sensitive to the higher chlorinated PCBs (Hansen 1987a). It is important to point out that lethality has been observed in animals that have accumulated high residues of PCBs and then were subjected to stressful conditions. Thus, the high LD_{50}s may well underestimate the acute toxicity of PCBs under conditions of stress.

Many field and laboratory effects definitively implicate PCBs in both reproductive and developmental toxicity (Hansen 1987a). These effects range from decreased libido and decreased sperm count and motility to embryo/fetal mortality and overt teratogenesis. Because of the environmental ubiquity and persistence of PCBs, they have been documented to have significant deleterious effects on whole ecological populations (e.g., common terns, grey seals, English sole, beluga whales). As previously discussed, stress can potentiate the effects of PCBs. Reproduction is clearly a stressful condition, and the effects of chronic PCB intoxication may be manifest in the widespread reproductive toxicity that has been documented.

Toxicokinetics

PCBs are highly lipophilic and, as such, readily cross the gastrointestinal membranes and pass into the blood stream. After entering the blood stream, PCBs are rapidly distributed to various tissues and organs, depending upon their respective blood flow perfusion rates. Placental transport, fetal accumulation, and distribution to breast milk can occur. Mobilization from fat appears to depend primarily upon the rates of metabolism of the individual PCB congeners. Because of its high blood flow rate, the liver receives a large fraction of the parent PCB early on and it converts PCBs to their metabolites depending upon the particular PCB congener (Lutz and Dedrick 1987).

Metabolism

Phase I metabolism of the parent PCB occurs in the liver by the mixed fraction monooxidases,

yielding hydroxylated products. The metabolites can be conjugated to glucuronides, which are excreted via the bile into the gut lumen. Some of the metabolites formed enter the hepatic blood supply, which returns them to the blood pool and then redistributes them to other tissues.

The metabolism rates of PCBs are greatly affected by the degree of chlorination of the biphenyl ring and by the chlorine position on the ring. In general, the rate of metabolism (km) decreases with increasing chlorination. The *meta* and *para* positions appear to be the preferred sites for arene oxide formation; and since the arene oxides have been implicated as the reactive intermediate for the covalent binding of PCB to subcellular macromolecules, the more rapidly metabolized congeners may pose a greater threat of toxicity than the more persistent, but more slowly metabolized, congeners. Phase I PCB metabolites are more bioactive, and may be 10 times more acutely toxic than the parent PCB compound (Hansen 1987b).

Excretion depends on the metabolism of PCBs to more polar compounds, which are mostly eliminated in the feces, although considerable amounts can be found in the urine. The biological half-lives of PCBs can vary widely, depending upon the structure-dependent metabolism of the different congeners, tissue affinities, and factors influencing mobilization from storage sites.

Toxicity Values

USEPA has determined an oral RfD of 0.00002 mg/kg-day for Aroclor 1254 (USEPA 2010). The Aroclor 1254 oral RfD contains an uncertainty factor of 300 (based upon 10-fold increase for sensitive individuals, a factor of 3 for extrapolation from rhesus monkeys to humans, and an increase from subchronic to chronic exposure).

Using the high-risk tier on the basis of site-specific exposure and persistence, USEPA's current upper-bound cancer slope factor is 2.0(mg/kg-day)$^{-1}$ (USEPA 2010), and is based on an oral feeding study of Aroclor 1260 in rats (Norback and Weltman 1985). In addition, the CalEPA has identified slope factors for PCB congeners based upon toxicity equivalent factors (TEF) for dioxin-liked PCBs. The oral slope factor for 2,3,7,8-TCDD, 1.3 x 10^5 (mg/kg-day)$^{-1}$, is modified based upon the appropriate TEF (CalEPA 2003). For risk-based screening in this HHRA, oral slope factors for the PCB congener 126 are used based upon the relative toxicity to ensure a conservative screening. However, this congener was not detected at the site and use of this toxicity value is not appropriate for the mixture of PCB congeners. ATSDR notes, "A three-category approach is used that considers how environmental processes (partitioning, chemical transformation, and bioaccumulation) affect each exposure pathway or situation by altering the composition and cancer potential of the original PCB mixtures. The highest slope factor (2.0 per [mg/kg]/day) is for the high risk and persistent category, which is used for pathways in which environmental processes are likely to increase risk, such as food chain exposure, sediment or soil ingestion, dust or aerosol inhalation, and exposure to dioxin-like, tumorpromoting, or persistent congeners. Due to the potential for higher sensitivity in early life, the highest slope factor is also used for all early-life exposures. An intermediate slope factor (0.4 per [mg/kg]/day) is used for the low risk and persistence category, which is appropriate for exposure pathways in which environmental processes tend to decrease risk, such as drinking water ingestion of water soluble congeners, inhalation of evaporated congeners, and dermal exposure (because PCBs are incompletely absorbed through the skin). The lowest slope factor (0.07 per [mg/kg]/day) applies

to the lowest risk and persistence category, and is used when congener or homologue analyses of an environmental mixture verify that congeners with more than four chlorines comprise <0.5% of total PCBs, as well as the absence of dioxin-like, tumor-promoting, and persistent congeners." (ATSDR 2000) Complete exposure pathways within this HHRA fall under the high risk (ingestion of fish and crab tissue) and low risk (dermal exposure). It is appropriate to use the highest slope factor of 2.0 $(mg/kg\text{-}day)^{-1}$ for carcinogenic risk characterization for all Aroclor mixtures for all complete exposure pathways. However, to remain conservative an oral slope factor of 13 $(mg/kg\text{-}day)^{-1}$ is used based upon the detected PCB congeners at the site for any risk-based screening.

References

Andrews, J. E. 1989. Polychlorinated biphenyl (Aroclor® 1254) induced changes in femur morphometry calcium metabolism and nephrotoxicity. *Toxicology*. 57:83-96 (cited in USEPA 2010).

Arnold, D. L., Bryce, R., Stapley, R., et al. 1993a. Toxicological consequences of Aroclor® 1254 ingestion by female Rhesus (Macaca mulatta) Monkeys, Part 1A: prebreeding phase-clinical health findings. *Food. Chem. Toxicol*. 31:799-810.

Arnold, D. L., Bryce, R., Karpinski, K., et al. 1993b. Toxicological consequences of Aroclor® 1254 ingestion by female Rhesus (Macaca mulatta) Monkeys, Part 1B: prebreeding phase-clinical and analytical laboratory findings. *Food. Chem. Toxicol*. 31:811-824.

ATSDR (Agency for Toxic Substances and Disease Registry). 2000. *Toxicological Profile for Polychlorinated Biphenyls.* Public Health Service, U.S. Department of Health and Human Services. November.

Aulerich, R. J., Bursian, S. J., Breslin, W. J., Olson, B. A., and Ringer, R. K. 1985. Toxicological manifestations of 2,4,5,2',4',5'-, 2,3,6 ,2',3',6'-, and 3,4,5,3',4',5'-hexachlorobiphenyl and Aroclor® 1254 in mink. *J. Toxicol. Environ. Health* 15:63-79 (cited in USAF 1989).

Aulerich, R. J., Ringer, R. K., Seagram, H. L., and Yoriatt, W. G. 1971. Effects of feeding coho salmon and other Great Lakes fish on mink reproduction. *Can. J. Zool*. 49:611-616 (cited in USAF 1989).

Baker, F. D., Bush, B., Tumasonis, C. F., and Lo, F. C. 1977. Toxicity and persistence of low-level PCB in adult Wistar rats, fetuses and young. *Arch. Environ. Contam. Toxicol*. 5:143-156 (cited in USAF 1989).

Bergman, A., Klasson-Wheler, E., and Kuroki, H. 1994. Selective retention of hydroxylated PCB metabolites in blood. *Environ. Health Perspect*. 102:464-469 (cited in ATSDR 2000).

Berry, D. L., DiGiovanni, J., Juchau, M. R., et al. 1978. Lack of tumor-promoting ability of certain environmental chemicals in a two-stage mouse skin tumorigenesis assay. *Res. Commun. Chem. Pathol. Pharmacol*. 20:101-108 (cited in ATSDR 2000).

Berry, D. L., Slaga, T. J., DiGiovanni, J., et al. 1979. Studies with chlorinated dibenzo-p-dioxins, polybrominated biphenyls, and polychlorinated biphenyls in a two-stage system of mouse skin tumorigenesis: Potent anticarcinogenic effects. *Ann. NY Acad. Sci*. 320:405-414 (cited in ATSDR 2000).

Bertazzi, P. A., Riboldi, L., Pesatori, A., et al. 1987. Cancer mortality of capacitor manufacturing workers. *Am. J. Ind. Med*. 11:165-176 (cited in ATSDR 2000).

Bleavins, M. R., Breslin, W. J., Auerlich, R. J., et al. 1984. Placental and mammary transfer of a polychlorinated biphenyl mixture (Aroclor® 1254) in the European ferret (*Mustela putorius furo*). *Environ . Toxicol. Chem*. 3: 637-644 (cited in ATSDR 2000).

Brezner, E., Terkel, J., and Perry, A. S. 1984. The effect of Aroclor® 1254 (PCB) on the physiology of reproduction in the female rat - I. *Comp. Biochem. Physiol*. 77C:65-70 (cited in USAF 1989).

Bruckner, J. V., Khanna, K. L., and Cornish, H. H. 1974. Effect of prolonged ingestion of polychlorinated biphenyls on the rat. *Food Cosmet. Toxicol*. 12:323-330 (cited in USEPA 2010).

Byrne, J. J., Carbone, J. P., and Hanson, E. A. 1987. Hypothyroidism and abnormalities in the kinetics of thyroid hormone metabolism in rats treated chronically with polychlorinated biphenyl and polybrominated biphenyl. *Endocrinology* 121:520-527 (cited in USAF 1989).

CalEPA. 2003. *WHO/97 Toxic equivalency factors (TEFs)*, (Source : van Leeuwen, 1997). Office of Environmental Health Hazard Assessment.

Carter, J. R., and Koo, S. I. 1984. Effects of dietary Aroclor® 1254 (PCBs) on serum levels of lipoprotein cholesterol and tissue distribution of zinc, copper, and calcium in Fischer rats. *Nutr. Rep. Int*. 29:223-232 (cited in ATSDR 2000).

Carter, J. W. 1984. Hypercholesterolemia induced by PCBs (Aroclor® 1254) in Fischer rats. *Bull. Environ. Contam. Toxicol*. 33:78-83 (cited in ATSDR 2000).

Carter, J. W. 1985. Effects of dietary PCBs (Aroclor® 1254) on serum levels of lipoprotein cholesterol in Fischer rats. *Bull. Environ. Contam. Toxicol*. 34:427-431 (cited in ATSDR 2000).

Chang, K. J., Hsieh, K. H., Lee, T. P., Tang, S. Y., and Tung, T. C. 1981. Immunologic evaluation of patients with polychlorinated biphenyl poisoning: Determination of lymphocyte subpopulations. *Toxicol. Appl. Pharmacol*. 61:58-63 (cited in USAF 1989).

Chen, R. C., Tang, S. Y., Miyata, H., Kashimoto, T., Chang, Y. C., Chang, K. J., and Tung, T. C. 1985. Polychlorinated biphenyl poisoning: Correlation of sensory and motor nerve

conduction, neurologic symptoms, and blood levels of polychlorinated biphenyls, quaterphenyls and dibenzofurans. *Environ. Res*. 37:340-348 (cited in USAF 1989).

Curley, A., Burse, V. W., Grim, M.E. et al. 1971. Polychlorinated biphenyls: Distribution and storage in body fluids and tissues of Sherman rats. *Environ Res*. 4:481-495 (cited in ATSDR 2000).

DiGiovanni, J., Viaje, A., Berry, D. L., et al. 1977. Tumor-initiating ability of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and Aroclor® 1254 in the two-stage system of mouse carcinogenesis. *Bull. Environ. Contam. Toxicol*. 18:552-557 (cited in ATSDR 2000).

Gage, J. C., and Holm, S. 1976. The influence of molecular structure on the retention and excretion of polychlorinated biphenyls by the mouse. *Toxicol. Appl. Pharmacol*. 36:555-560 (cited in ATSDR 2000). >

Geistfeld, J. G., Bond, M. G., Bullock, B. C., and Varian, M. C. 1982. Mucinous gastric hyperplasia in a colony of rhesus monkeys (Macaca mulatta) induced by polychlorinated biphenyl (Aroclor® 1254). *Lab. Anim. Sci*. 32:83-86 (cited in USAF 1989).

Hansen, L. G., Welborn, M. E., Borchard, R. E., et al. 1977. Tissue distribution of PCB components in swine and sheep fed three different rations containing Aroclors 1242 and 1254. *Arch. Environ. Contam. Toxicol*. 5: 257-278 (cited in ATSDR 2000).

Hendricks, J. D., Putnam, T. P., Bills, D. D., and Sinnhuber, R. O. 1977. Inhibitory effect of a polychlorinated biphenyl (Aroclor® 1254) on Aflatoxin B1 carcinogenesis in rainbow trout (Salmo gairdneri). *J. Natl. Cancer Inst*. 59:1545-1551 (cited in USAF 1989).

HSDB (Hazardous Substances Data Base). 1995. Aroclor® 1254 file. Retrieved online December 4, 1995.

IARC (International Agency for Research on Cancer). 1978. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Some anti-thyroid and related substances, nitrofurans and industrial chemicals. Vol. 7. IARC, Lyon, France, pp. 261-289.

Ito, N., Nagasaki, H., Arai, M., et al. 1973. Histopathologic studies on liver tumorigenesis induced in mice by technical polychlorinated biphenyls and its promoting effect on liver tumors induced by benzene hexachloride. *JNCI*. 51:1637-1646 (cited in USEPA 2010).

Iverson, F., Truelove, J., and Hierlihy, S. L. 1982. Hepatic microsomal enzyme induction by Aroclors 1248 and 1254 in cynomolgus monkeys. *Food Chem. Toxicol*. 20:307-310.

Kimbrough, R. D., and Linder, R. E. 1974. Induction of adenofibrosis and hepatomas of the liver in BALB/cJ mice by polychlorinated biphenyls (Aroclor® 1254). *JNCI*. 53:547-552.

Kimbrough, R. D., Linder, R. E., and Gaines. T. B. 1972. Morphological changes in livers of rats fed polychlorinated biphenyls. *Arch. Environ. Health*. 25:354-364 (cited in USEPA

2010).

Kimbrough, R. D., Squire, R. A., Linder, R. E., Strandberg, J. D., Montali, R. J., and Burse, V. W. 1975. Induction of liver tumors in Sherman strain female rats by polychlorinated biphenyl (Aroclor® 1260). *J. Nat. Cancer Instit*. 55(6):1453-1456 (cited in USAF 1989).

Kling, D., and Gamble, W.. 1982. Cholesterol biosynthesis in polychlorinated biphenyl-treated rats. *Environ. Res*. 27:10-15 (cited in USEPA 2010).

Kling, D., Kunkle, J., Roller, A. S., et al. 1978. Polychlorinated biphenyls: In vivo and in vitro modifications of cholesterol and fatty acid biosynthesis. *J. Environ. Pathol. Toxicol*. 1:813-828 (cited in USEPA 2010).

Lawton, R. W., Ross, M. R., Feingold, J., and Brown, J. F., Jr. 1985. Effects of PCB exposure on biochemical and hematological findings in capacitor workers. *Environ. Health Perspect*. 60:165-184 (cited in USAF 1989).

Linzey, A. V. 1988. Effects of chronic polychlorinated biphenyls exposure on growth and reproduction of second generation white-footed mice (Peromyscus leucopus). *Arch. Environ. Contam. Toxicol*. 17:39-45 (cited in USAF 1989).

Litterset, C. L., Farber, T. M., Baker, A. M., et al. 1972. Effect of polychlorinated biphenyls on hepatic microsomal enzymes in the rat. *Toxicol. Appl. Pharmacol*. 23:112-122 (cited in IRIS 1995a).

Maroni, M., Columbi, A., Arbosti, G., et al. 1981a. Occupational exposure to polychlorinated biphenyls in electrical workers. II. Health effects. *Br. J. Ind. Med*. 38:55-60 (cited in ATSDR 2000).

Maroni, M., Columbi, A., Arbosti, G., et al. 1981b. Occupational exposure to polychlorinated biphenyls in electrical workers. I. Environmental and blood polychlorinated biphenyls concentrations. *Br. J. Ind. Med*. 38:49-54 (cited in ATSDR 2000).

Masuda, Y., and Yoshimura, H. 1984. Polychlorinated biphenyls and dibenzofurans in patients with Yusho and their toxicological significance: A review. *Am. J. Ind. Med*. 5:31-44.

Meigs, J. W., Albom, J. J., and Kartin, B. L. 1954. Chloracne from an unusual exposure to Aroclor. *J. Am. Med. Assoc*. 154:1417-1418 (cited in ATSDR 2000).

Mes, J., Doyle, J. A., Adam, B. R., et al. 1984. Polychlorinated biphenyls and organochlorine pesticides in milk and blood of Canadian women during lactation. *Arch. Environ. Contam. Toxicol*. 13:217-223 (cited in ATSDR 2000).

Miller, R. W. 1985. Congenital PCB poisoning: A reevaluation. *Environ. Health Perspect*. 60:211-214 (cited in USAF 1989).

Morgan, R. W., Ward J. M., and Hartman, P. E. 1981. Aroclor® 1254-induced intestinal metaplasia and adenocarcinoma in the glandular stomach of F344 rats. *Cancer Res*. 41:5052-5059 (cited in USAF 1989).

NCI (National Cancer Institute) 1978. Bioassay of Aroclor" 1254 for possible carcinogenicity. NCI Carcinogenesis Technical Report Series Number 38, NCI-CG-TR-38, DHEW Publication No. (NIH) 78-838 (cited in USAF 1989).

NIOSH (National Institute for Occupational Safety and Health). 1975. Current Intelligence Bulletin 7, Polychlorinated Biphenyls (PCBs) (cited in USAF 1989).

Norback, D. H., and Weltman, R. H. 1985. Polychlorinated biphenyl induction of hepatocellular carcinoma in the Sprague-Dawley rat. *Environ. Health Perspect*. 6:97-105 (cited in USAF 1989).

Overmann, S. R., Kostas, J., Wilson, L. R., Shain, W., and Bush, B. 1987. Neurobehavioral and somatic effects of perinatal PCB exposure in rats. *Environ. Res*. 44:56-70 (cited in USAF 1989).

Poland, A., Knutson, J., Glover, E., et al. 1983. Tumor promotion in the skin of hairless mice by halogenated aromatic hydrocarbons. In: Weinstein, I. B., Vogel, H. J. eds. *Genes and proteins in oncogenesis*. New York, NY: Academic Press, 143-161 (cited in ATSDR 2000).

Price, S. C., Ozalp, S., Wever, R., et al. 1988. Thyroid hyperactivity caused by hypolipidaemic compounds and polychlorinated biphenyls: The effect of coadministration in the liver and thyroid. In: Chambers, L., ed. The target organ and the toxic process: Proceedings of the European Society of Toxicology, Strasbourg, September 17-19. New York: Springer-Verlag, 85-92 (cited in ATSDR 2000).

Puhvel, S. M., Sakamoto, M., Ertl, D. C., et al. 1992. Hairless mice as models for chloracne: A study of cutaneous changes induced by topical application of established chloracnegens. *Toxicol. Appl. Pharmacol*. 64:492-503 (cited in ATSDR 2000).

Rao, C. V., and Banerji, A. S. 1988. Induction of liver tumors in male Wistar rats by feeding polychlorinated biphenyls (Aroclor® 1260). *Cancer Lett*. 39:59-67 (cited in USAF 1989).

Ringer, R. K., Aulerich, R. J., and Zabik, M. 1972. *Effect of dietary polychlorinated biphenyls on growth and reproduction of mink*. 164th Natl. Meet. Am. Chem. Soc. 12:149 (cited in USAF 1989).

Safe, S. 1980. Metabolism, uptake, storage and bioaccumulation of halogenated aromatic pollutants. In: Kimbrough, R. D., ed. *Halogenated biphenyls, terphenyls, naphthalenes, dibenzodioxins and related products*. Amsterdam: Elsevier Science Publishers, 81-107.

Sager, D. B. 1983. Effect of postnatal exposure to polychlorinated biphenyls on adult male

reproductive function. *Environ. Res*. 3:76-94 (cited in USAF 1989).

Sager, D., and Girard, D. 1983. Early postnatal exposure to PCBs and reproductive function in young and mature adult female rats. *Fed. Proc*. 42:355. Abstract No. 372 (cited in USAF 1989).

Sanders, O. T., Zepp, R. L., and Kirkpatric, R. L. 1974. Effect of PCB ingestion on sleeping times, organ weights, food consumption, serum corticosterone and survival of albino mice. *Bull. Environ. Contam. Toxicol*. 12:394-399 (cited in ATSDR 2000).

Schaeffer, E., Greim, H., and Goessner, W. 1984. Pathology of chronic polychlorinated biphenyl (PCB) feeding in rats. *Toxicol. Appl. Pharmacol*. 75:278-288 (cited in USAF 1989).

Seegal, R. F., Brosch, K. O., and Bush, B. 1986. Regional alterations in serotonin metabolism induced by oral exposure of rats to polychlorinated biphenyls. *Neurotoxicology*. 7:155-166 (cited in ATSDR 2000).

Shigematsu, N., Ishimaru, S., Saito, R., Ikeda, T., Matsuba, K., Sugiyama, K., and Masuda, Y. 1978. Respiratory involvement in polychlorinated biphenyls poisoning. *Environ. Res*. 16:92-100 (cited in USAF 1989).

Smith, A. B.; Schloemer, J.; Lowry, L. K.; Smallwood, A. W.; Ligo, R. N.; Tanaka, S.; Stringer, W.; Jones, M.; Hervin, R.; Glueck, C.J. 1982. Metabolic and health consequences of occupational exposure to polychlorinated biphenyls. Br. J. Ind. Med. 39:361-369 (cited in USAF, 1989).

Spencer, F. 1982. An assessment of the reproductive toxic potential of Aroclor® 1254 in female Sprague-Dawley rats. *Bull. Environ. Contam. Toxicol*. 28:290-297 (cited in USAF 1989).

Street, J. C., and Sharma, R. P. 1975. Alteration of induced cellular and humoral immune responses by pesticides and chemicals of environmental concern: Quantitative studies of immunosuppression by DDT, Aroclor® 1254, carbofuran, and methylparathion. *Toxicol. Appl. Pharmacol*. 32:587-602 (cited in USEPA 2010).

Tanabe, S., Nakagawa, Y, and Tatsukawa, R.. 1981. Absorption efficiency and biological half-life of individual chlorobiphenyls in rats treated with Kanechlor products. *Agric. Biol. Chem*. 45:717-726 (cited in ATSDR 2000).

Taylor, P. R., Lawrence, C. E., Hwang, H.-L., and Paulson, A. S. 1984. Polychlorinated biphenyls: Influence on birthweight and gestation. *Am. J. Public Health* 74:1153-1154 (cited in USAF 1989).

Treon, J. F., Cleveland, M. D., Cappel, J. W., and Atchley, R. W. 1956. The toxicity of the vapors of Aroclor®1242 and Aroclor® 1254. *Am. Ind. Hyg. Assoc. Q*. 17:204-213.

Truelove, J., Grant, D., Mes, J., Tryphonas, H., Tryphonas, L., and Zawidzka, Z. 1982. Polychlorinated biphenyl toxicity in the pregnant cynomolgus monkey: A pilot study.

Arch. Environ. Contam. Toxicol. 11:583-588 (cited in USAF 1989).

Truelove, J. F., Tanner, J. R., Langlois, I. A., Stapley, R. A., Arnold, D. L., and Mes, J. C. 1990. Effect of polychlorinated biphenyls on several endocrine reproductive parameters in the female rhesus monkey. *Arch. Environ. Contam. Toxicol*. 19:939-943.

Tryphonas, H., Hayward, S., O'Grady, L., et al. 1989. Immunotoxicity studies of PCB (Aroclor® 1254) in the adult rhesus (Macaca mulatta) monkey--preliminary report. *Int. J. Immunopharmacol*. 11:199-206.

Tryphonas, H., Luster, M. I., Schiffman, G., et al. 1991a. Effect of chronic exposure of PCB (Aroclor® 1254) on specific and nonspecific immune parameters in the rhesus (Macaca mulatta) monkey. *Fund. Appl. Toxicol*. 16:773-786.

Tryphonas, H., Luster, M. I.,White, K. L., et al. 1991b. Effects of PCB (Aroclor® 1254) nonspecific immune parameters in rhesus (Macaca mulatta) monkeys. *Int. J. Immunopharmacol*. 13:639-648.

USAF (U.S. Air Force). 1989. The Installation Restoration Program Toxicology Guide. Volume 3. Aerospace Medical Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. pp. 52-1-52-68.

USEPA (U.S. Environmental Protection Agency). 2010. Integrated Risk Information System (IRIS) database maintained on the Internet at http://www.epa.gov/iris. USEPA Environmental Criteria and Assessment Office, Cincinnati.

USEPA. 1995. *Health Effects Assessment Summary Tables*. Annual FY-95. Prepared by the National Center for Environmental Assessment Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, D.C.

USEPA. 1980. *Ambient water quality criteria for polychlorinated biphenyls*. USEPA Report No. 440/5-80-068. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water Regulations and Standards. PB81-117798 (cited in USAF 1989).

USEPA. 1977. Code of Federal Regulations. 40 *CFR* 129.4.

Ward, J. R. 1985. Proliferative lesions of the glandular stomach and liver in F344 rats fed diets containing Aroclor® 1254. *Env. Health. Perspect*. 60:89-95.

Weltman, R. H., and Norback, D. H. 1982. Development of hepatocellular and cholangiocellular neoplasms in the livers of male and female Sprague-Dawley rats after chronic administration of Aroclor® 1260. *Fed. Proc*. 41:446. Abstract No. 1029 (cited in USAF 1989).

Yamashita, F. 1977. Clinical features of polychlorbiphenyls (PCB)-induced fetopathy. *Paediatrician* 6:20 (cited in USAF 1989).

SELENIUM

Selenium (Se; CAS Registry No. 7782-49-2) occurs in five oxidation states (-2, 0, +2, +4, and +6) that will markedly affect the environmental and toxicological behavior of a selenium-bearing compound. The most common environmental form is selenate (Se^{+6}), but selenite (Se^{+3}) and selenides (Se^{-2}) are also frequently present, depending on specific chemical/microenvironmental parameters such as oxidation-reduction status, aerobicity or anaerobicity, and biotic or non-biotic components. Commercially used selenium is a byproduct of copper ore refining. Its chief applications are in the manufacture of glass, pigments, ceramics, and semiconductors; xerography; rectifiers, steel; photography; photoelectric cells; catalysts; and rubber vulcanizing. Selenium compounds also have human and veterinary medicinal uses (HSDB 2010).

Found in all human and animal tissue, selenium is necessary to the function of the antioxidant enzyme glutathione peroxidase and is thus an essential trace element in the diet. The many forms of selenium in nature give rise to substantial variations in the degree of potential toxicity.

Cancer

According to USEPA (USEPA 2010), selenium is not classifiable as to carcinogenicity (Category D) in humans, based on inadequate human data and inadequate evidence of carcinogenicity in animals. However, evidence for selenium sulfide is sufficient for a Category B2 (probable human carcinogen) classification (USEPA 2010). Much of the investigation into the role of selenium and cancer has been spurred by observations of a potential preventative role of selenium for carcinogenesis (WHO 1987), although caveats can be made concerning the relative dose, chemical speciation, and interactions with other compounds (Parizek 1990). When carcinogenic responses have been observed, tumors were primarily associated with the gastrointestinal tract, but pulmonary and hematological cancers were also observed (Parizek 1990; WHO 1987).

Mutagenicity

Data on the mutagenicity of selenium and its compounds are equivocal (USEPA 2010), even for the same selenium compound: selenate was mutagenic in *Salmonella* assays (Noda et al. 1979) but negative in the *Rec* assay (Nakamuro et al. 1976) and selenite was mutagenic in one *Salmonella* assay (Noda et al. 1979), genotoxic in a *Bacillus* assay (Nakamuro et al. 1976), but negative in another *Salmonella* assay (Lofroth and Ames 1978). Other assays generally result in positive results (e.g., unscheduled DNA synthesis, chromosomal aberrations, and sister chromatid exchange) but the potency of various selenium compounds varied among the assays (studies cited in USEPA 2010).

Systemic Toxicity

Because of its role as a nutritionally essential element, selenium is subject to homeostatic mechanisms that attempt to maintain a physiologically balanced supply of the nutrient. Thus, altered selenium status can create problems of both deficiency or excess. Selenium deficiency is primarily a topic for nutritionists, and only selenium excess (toxicity) will be considered here.

An additional consideration is the chemical speciation of the nutrient. Generally, the element must be in a biologically-available form (*e.g.*, a soluble salt) to exert toxic effects; insoluble forms usually preclude any significant absorption into an organism.

As a dietary requirement, oral exposure to selenium has been well studied in animals and humans. Excess ingestion of selenium can produce toxic effects in a variety of organs or organ systems: dermal, hepatic, pulmonary, pancreatic, and reproductive (WHO 1987). In over-exposed human populations, hair loss and nail pathology were the most apparent clinical signs; however, these humans lacked the signs of hepatotoxicity that is commonly encountered in over-exposed laboratory animals (studies cited in Levander and Burk 1994; Parizek 1990; studies cited in WHO 1987). One of the more striking signs of selenium toxicity has been its effects on reproduction, including decreased performance (reduced litter sizes, for example) in farm animals and laboratory rodents, and development of deformities in domestic fowl and wild birds (studies cited in WHO 1987).

Yang et al. (1989b), in a follow-up to an earlier study (Yang et al. 1983), studied a population of approximately 400 individuals living in an area of China with unusually high environmental concentrations of selenium. The subjects were evaluated for clinical and biochemical signs of selenium intoxication. Three geographical areas with low, medium and high selenium levels in the soil and food supply were chosen for comparison in the studies. The Yang et al. (1989a,b) studies provide a large sample size and include additional analysis of tissue selenium levels, allowing a more accurate estimation of the dose-response relationship observed for selenium toxicity. Selenium levels in soil and approximately 30 typical food types commonly eaten by the exposed population showed a positive correlation with levels in blood and tissue. Daily average selenium intakes, based on lifetime exposure, ranged from 62 to 1438 μg for adult males and females. Analysis of the results indicated that perisistent clinical signs of selenosis were observed in only 5 of 349 adults comprising a potentially sensitive subpopulation. Clinical signs observed included the characteristic "garlic odor" of excess selenium excretion in the breath and urine, thickened and brittle nails, hair and nail loss, lowered hemoglobin levels, mottled teeth, skin lesions and CNS abnormalities. Alterations in the measured biochemical parameters occurred at dietary intake levels of 750-850 μg/day, including a delay in prothrombin time, *i.e.*, increase in blood coagulation time and reduction in blood glutathione concentration. However, these indicators were poorly characterized and are not typically used as an index for clinical selenosis resulting from chronic exposure to selenium (NRC 1989). Based upon the blood selenium levels shown to reflect clinical signs of selenium intoxication, a whole blood selenium concentration of 1.35 mg/L corresponding to 1.261 mg of daily selenium intake is indicative of the lowest correlative selenium intake causing overt signs of selenosis. The next lowest whole blood selenium concentration of 1.0 mg/L, corresponding to 0.853 mg selenium/day, produces no clinical signs of selenosis. The NOAEL for this study is 0.85 mg selenium/day and the LOAEL is 1.26 mg selenium/day.

Inhalation toxicity of selenium compounds has been studied in laboratory rodents, typically under conditions that attempt to mimic occupational exposures (WHO 1987). In one study, rats were exposed to 10/30, 6/9, or 3/5 μg/L SeO_2 in air every other day for six hours for one month (Filatova 1951). Rats in the lowest dose exhibited liver and kidney degeneration, cardiac dystrophy, and splenic hyperaemia and hypertrophy, while rats in higher dos-groups had much

more severe effects, including mortality. Week-long exposure of rabbits to 20 μg/L SeO_2 in air or 40 mg/m^3 amorphous selenium caused a decrease in catalase activity, while a 12-week exposure to 10 μg/L SeO_2 in air or 20 mg/m^3 amorphous selenium caused a decrease in total- and reduced glutathione, but without a change in the amount of oxidized glutathione (Lipinskij 1962).

Dermal toxicity of selenium compounds appears largely unstudied. The application of 83 mg of selenium oxychloride to the skin of rabbits was lethal within 5 hours, and 4 mg was lethal within 24 hours (Dudley 1938).

Toxicokinetics

Selenium is potentially absorbed through all routes of exposure: dermal contact, inhalation, and ingestion. Gastrointestinal absorption in humans is typically greatest for organically-complexed selenium (e.g., selenomethionine; approaching 97 percent of the administered dose), followed by selenate (approximately 90 percent), and selenite (approximately 60 percent) (Levander 1994; various studies cited in WHO 1987). Selenium distributes throughout the body, with highest concentrations occurring in the kidney, liver, and adrenal glands in rodent studies; muscle tissue carries the greatest content of selenium, though, because of the large relative mass of this tissue relative to other tissues (Thomson and Stewart 1973). The predominant form of selenium in animal tissues is selenocysteine (Hawkes et al. 1985). Tracer studies of orally-administered radioactive selenium in human subjects indicated that elimination of selenium was primarily via urine (Griffiths et al. 1976); however, selenium as a minor component of the human diet tended to be eliminated equally in urine and feces (Robinson et al. 1973; Stewart et al. 1978). Expiration of selenium is a minor route except in cases of very high exposure (Levander and Burk 1994), and the role of sweat in the excretion of selenium is also minor (WHO 1987).

Metabolism

The primary pathway for absorbed selenium in animals is towards reduction, in which selenates or organo-selenium are reduced to selenite (Levander 1976). Selenite then may form selenotrisulfides out of reactions with glutathione or sulfhydryl moieties present on proteins (Ganther 1968; Jenkins and Hidiroglou 1971). Inorganic selenium may be converted to organo-selenium (as seleno-cysteine) via a series of reactions involving a unique transfer-RNA, the activation of this tRNA via phosphorylation, and exchange of phosphate for selenium, yielding selenocysteine (Levander and Burk 1994). Excretion of selenium may occur via urinary elimination of trimethylselenonium ions (Byard 1969; Levander and Burk 1994; Palmer et al. 1969), and when this methylation pathway is overridden, the volatile compound dimethyl selenide is produced and eliminated via exhalation (McConnell and Portman, 1952). In general, the metabolism of selenium in humans is similar to that found in animals (WHO 1987), although species-specific differences do exist, for example, in that humans retain a greater proportion of seleno-methionine than selenite, whereas rats retain each compound equally (Richold et al. 1977).

Toxicity Values

USEPA (2010) has established an oral RfD for selenium of 5 x 10^{-3} mg/kg-d based on a NOAEL of 0.015 mg/kg-d for clinical selenosis identified in a human epidemiology study (Yang et al. 1989b), using an uncertainty factor of 3 to account for a range of human sensitivities.

References

Byard, J.L. 1969. Trimethyl selenide: a urinary metabolite of selenite. *Arch. Biochem. Biophys.* 130: 556□560. (as cited in WHO 1987)

Dudley, H.C. 1938. Toxicology of selenium. V. Toxic and vesicant properties of selenium oxychloride. *Public Health Rep.* 53: 94□98. (as cited in WHO 1987)

Filatova, V.S. 1951. On the toxicity of selenium chloride. *Gig. i Sanit.* 5:18-23. (In Russian) (as cited in WHO 1987)

Ganther, W.E. 1968. Selenotrisulfides. Formation by the reaction of thiols with selenious acid. *Biochemistry* 7: 2898□2905. (as cited in WHO 1987)

Griffiths, N.M., R.D. H. Stewart, and M.F. Robinson. 1976. The metabolism of ^{75}Se-selenomethionine in four women. *Br. J. Nutr.* 35: 373-382. (as cited in WHO 1987)

Hawkes, W.C., E.C. Wilhelmsen, and A.L. Tappel. 1985. *J. Inorg. Biochem.* 23: 77-92. (as cited in Levander and Burk 1994)

HSDB (Hazardous Substances Data Bank). 2010. Database maintained on the Internet at http://sis.nlm.nih.gov/sis1 by the National Institutes of Health, National Library of Medicine, Specialized Information Services, Bethesda, Maryland.

Jenkins, K.J., and M. Hidiroglou. 1971. Comparative uptake of selenium by low cystine and high cystine proteins. *Can. J. Biochem.* 49: 468-472. (as cited in WHO 1987)

Levander, O.A. 1976. Selected aspects of the comparative metabolism and biochemistry of selenium and sulfur. Pp. 135-163 in A.S. Prasad, Ed. *Trace Elements in Human Health and Disease, Vol. 2. Essential and Toxic Elements.* Academic Press, New York. (as cited in WHO 1987)

Levander, O.A., and R.F. Burk. 1994. Selenium. Pp. 242-251 in M.E. Shils, J.A. Olson, and M. Shike, Eds. *Modern Nutrition in Health and Disease, 8th ed., Volume 1.* Lea & Febiger, Malvern, Pennsylvania.

Lipinskij, S. 1962. Background for evaluation of selenium as an industrial toxicant. *Gig. i Sanit.* 1: 9193. In Russian. (as cited in WHO 1987)

Lofroth, G., and B.N. Ames. 1978. Mutagenicity of inorganic compounds in *Salmonella typhimurium*: Arsenic, chromium and selenium. *Mutat. Res.* 53: 65-66. (as cited in USEPA 1995)

McConnell, K.P., and O.W. Portman. 1952. Excretion of dimethyl selenide by the rat. *J. Biol. Chem.* 195: 277-282. (as cited in WHO 1987)

Nakamuro, K., K. Yoshikawa, Y. Sayato, H. Kurata, M. Tonomura and A. Tonomura. 1976. Studies on selenium-related compounds. V. Cytogenetic effect and reactivity with DNA. *Mutat. Res.* 40: 177-184. (as cited in EPA 1995)

NRC (National Research Council). 1989. Pp. 217-224 in *Recommended Dietary Allowances, 10th ed.* National Academy Press, Washington, D.C.

Noda, M., T. Takano, and H. Sakurai. 1979. Mutagenic activity of selenium compounds. *Mutat. Res.* 66: 175-179. (as cited in EPA 1995)

Palmer, I.S., D.D. Fischer, A.W. Halverson, and O.E. Olson. 1969. Identification of a major selenium excretory product in rat urine. *Biochim. Biophys. Acta.* 208: 260□266. (as cited in WHO 1987)

Parizek, J. 1990. Health effects of dietary selenium. *Food Chem. Toxicol.* 28: 763-765.

Richold, M., M.F. Robinson, and R.D.H. Stewart. 1977. Metabolic studies in rats of ^{75}Se incorporated *in vivo* into fish muscle. *Br. J. Nutr.* 38: 19-29. (as cited in WHO 1987)

Robinson, M.F., J.M. McKenzie, C.D. Thomson, and A.L. Van Rij. 1973. Metabolic balance of zinc, copper, cadmium, iron, molybdenum and selenium in young New Zealand women. *Br. J. Nutr.* 30: 195-205. (as cited in WHO 1987)

Stewart, R.D.H., N.M. Griffiths, C.D. Thomson, and M.F. Robinson. 1978. Quantitative selenium metabolism in normal New Zealand women. *Br. J. Nutr.* 40: 45-54. (as cited in WHO 1987)

Thomson, C.D., and R.D.H. Stewart. 1973.Metabolic studies of ^{75}Se selenomethionine and ^{75}Se senite in the rat. *Br. J. Nutr.* 30: 139-147. (as cited in WHO 1987)

USEPA (U.S. Environmental Protection Agency). 2010. IRIS (Integrated Risk Information System) database maintained on the Internet at http://www.epa.gov/iris by EPA Environmental Criteria and Assessment Office, Cincinnati.

Yang, G., R. Zhou, S. Yin, *et al*. 1989a. Studies of safe maximal daily dietary selenium intake in a seleniferous area in China. I. Selenium intake and tissue levels of the inhabitants. *J. Trace Elem. Electrolytes Health Dis.* 3(2): 77-87.

Yang, G., S. Yin, R. Zhou, *et al*. 1989b. Studies of safe maximal daily dietary Se^- intake in a seleniferous area in China. II. Relation between Se^- intake and the manifestation of clinical signs and certain biochemical alterations in blood and urine. *J. Trace Elem. Electrolytes Health Dis.* 3(2): 123-130.

WHO (World Health Organization). 1987. Selenium. *Environmental Health Criteria, Vol. 58.*

VANADIUM

Vanadium (V; CAS Registry Number 7440-66-6) is a gray-to-lustrous-white elemental metal (pliable solid or powder) used primarily as an alloying agent in metals; as an ingredient in pesticides, dyes, and pigments; and as an industrial catalyst. Vanadium undergoes violent reactions in the presence of bromine trifluoride, chlorine, lithium, or oxidants; powdered vanadium explodes with chlorine even at 0°C. While functional roles for vanadium in humans have yet to be confirmed, evidence supports the concept that vanadium is an essential micronutrient for animals (French and Jones 1992).

Carcinogenicity

No studies regarding the carcinogenic effects of vanadium or vanadium compounds in humans or animals were located by ATSDR (1990f) during that Agency's initial review of the toxicological literature. The International Agency for Research on Cancer reported negative experimental evidence of the carcinogenicity of metallic vanadium, vanadyl ions, and trivalent vanadium 2,4-pentanedione (Boffetta 1993). Leonard and Gerber (1994) noted the lack of data for a carcinogenic determination, but mentioned that vanadium is mitogenic with the concomitant potential for associated carcinogenicity (e.g., Ames and Gold 1990). In a study by Bishayee et al. (1997), ammonium vanadate appeared to modulate several factors associated with erythropoiesis under carcinogenic challenge by diethylnitrosamine. On the other hand, recent evidence indicates that vanadium is a tumor promoter when it is able to transactivate AP-1-dependent gene expression. With vanadium, AP-1 transactivation is dependent on the generation of O_2- and H_2O_2, but not OH (Ding et al. 1999).

Mutagenicity

In vitro genotoxicity assays have shown that vanadium or vanadium compounds are generally positive in bacterial (Kada et al. 1980; Kanematsu et al. 1980), yeast (Sora et al. 1986), rodent (Smith 1983), and human cell (Birnboim 1988; Hanauske et al. 1987) studies. However, there are no *in vivo* assays which have assessed the genotoxicity of vanadium compounds (as reported by ATSDR 1990). In 1994 Leonard and Gerber concluded that vanadium compounds are not clastogenic, but can be weakly mutagenic. In a Syrian hamster embryo assay (Kerckaert et al. 1996), vanadium pentoxide was negative with a 24-hr exposure, but positive with a 7-day exposure. This pattern of response (24-hr SHE negative/7-day SHE positive) has been seen with other chemicals which have tumor promotion-like characteristics.

Systemic Toxicity

Study volunteers were fed capsules containing 0.47-1.3 mg V (as ammonium vanadyl tartrate) per kilogram of body weight for a duration of 3 months. No hematological, hepatic, or renal effects were found. Subjects reported intestinal cramping and diarrhea (Dimond et al. 1963); but without concurrent experimental controls, the reported effects are not necessarily directly attributable to vanadium (ATSDR 1990).

The major effects in humans from exposure to vanadium vapors, aerosols, and dusts are irritant in nature, as observed from a variety of occupational epidemiological studies, case reports, and clinical studies. In general, irritation to the respiratory tract occurs at lower concentrations than to skin or eyes (Calabrese and Kenyon 1991). Workers exposed to vanadium compound dust have reported dry mouth, rhinitis, epistaxis, tracheitis, metallic taste, green tongue, and irritated eyes. One of the primary acute effects of vanadium exposure is peripheral vasoconstriction of lungs, spleen, kidneys, and intestines. Prolonged exposure can cause cardiac arrythmias and bradycardia.

Rodent mortality (LD_{50}) occurred at doses of approximately 30-40 mg V (as $NaVO_3$) kg^{-1} (Llobet and Domingo 1984), but chronic dietary exposures at 4.1 mg V (as $VOSO_4$) were not lethal (Schroeder and Balassa 1967; Schroeder et al. 1970). A three-month exposure to $NaVO_3$ in drinking water produced mononuclear cell infiltration in rat lungs, primarily in the perivascular region (Domingo et al. 1985). Cardiovascular effects in rodents have also been reported (Susic and Kentera 1986).

Exposure of male white rats (n=11 per exposure group) to a 70-day continuous fumigation with 0, 0.002, or 0.27 mg V (as V_2O_5) m^{-3} produced significant systemic effects in the high-exposure group that were not observed in the low-exposure group (Pazynich 1966). Effects included alterations in motor chronaxy, decreased oxyhemoglobin content, effects on leukocyte nuclei, and pathological conditions in several organ systems (lungs, liver, kidneys, and heart). ATSDR (1990f) summarizes a variety of inhalation exposure studies, but presents quantitative exposure information only for acute studies; subchronic or chronic studies were apparently too deficient in detail to provide the Agency with quantitative toxicological information, and the effects presented in the studies are only cursorily discussed.

The effects of dermal exposure to vanadium or vanadium compounds appear to be largely unstudied. Dermal absorption and skin irritation were reported following the application to rabbit skin of a 20 percent solution of sodium metavanadate (Stokinger 1967); human skin absorption, however, may be very low (EPA 1977), as evidenced by a lack of skin penetration during an *in vitro* study using radiolabelled vanadium (Roshchin et al. 1980).

Toxicokinetics

For the general populace, exposures to vanadium compounds occur largely through food, while industrial workers are more commonly exposed to vanadium-containing dusts, fumes, and aerosols.

Vanadium is absorbed from a variety of foods with a relatively low efficiency, but in sufficient quantities to be stored at detectable levels in many body tissue (French and Jones 1992). Generally, less than 5 percent of the ingested dose is absorbed through the gastrointestinal tract (Byrne and Kosta 1978; Curran et al. 1959; Nielsen 1994), while airborne vanadium is absorbed very efficiently by the lungs (Boyd and Kustin 1985). The ICRP (1960) indicated that approximately 25 percent of soluble vanadium compounds may be absorbed via the respiratory tract. Although the body burden of vanadium is typically very small (French and Jones 1992), the element distributes throughout the body with preferential accumulation usually observed in

the liver, kidney, and bone (Byrne and Kosta 1978; Nechay et al. 1986; Mongold et al 1990). Blood is the medium for the distribution of vanadium, of which about 95 percent is bound to transferrin as the vanadyl ion (V^{+4} as VO^{+2}) (Patterson et al. 1986). Because of the low level of absorption via the gastrointestinal tract, the majority of ingested vanadium is excreted via the feces; absorbed vanadium is excreted primarily in the urine (IPCS 1988).

Metabolism

As an elemental molecule, vanadium *per se* is unmetabolizable, however, metabolic incorporations of vanadium have been studied. In the biological tissues, vanadium occurs largely as interconversions between two oxidation states: tetravalent vanadyl (V^{+4}) or pentavalent vanadate (V^{+5}) (ATSDR 1990f). Within the organism, the role of vanadium has yet to be definitively understood, although the following effects occur under conditions of vanadium deficiency: increased abortion and perinatal death rates, decrease milk production, hepatic lipid and phospholipid changes, growth impairment (of bone, tooth, and cartilage), nutritional edema, thyroid metabolism changes, and depressed overall growth (French and Jones 1992). The widely varying pharmacological actions of vanadium have been poorly understood and are receiving increasing attention, particularly with respect to insulinomimetic properties (French and Jones 1992).

Toxicity Values

The oral RfD toxicity value for Vanadium is derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight (MW) of the oxide ion (USEPA2010). Vanadium Pentoxide (V205) has a molecular weight of 181.88. The two atoms of Vanadium contribute 56% of the MW. Vanadium Pentoxide's oral RfD of 0.009 mg/kg-day multiplied by 56% gives a Vanadium oral RfD of 0.0054 mg/kg-day (USEPA 2010).

USEPA has not classified vanadium as to its carcinogenic potential (USEPA 2010).

References

Ames, B.N., and L.S. Gold. 1990. Too many rodent carcinogens: mitogenesis increases mutagenesis. *Science* 249:970-971.

ATSDR (Agency for Toxic Substances and Disease Registry). 2009. *Toxicological Profile for Vanadium and Compounds*. U.S. Public Health Service. September.

Birnboim, H.C. 1988. A superoxide anion induced DNA strand-break metabolic pathway in huma leukocytes: Effects of vanadate. *Biochem Cell. Biol.* 66:374-381.

Bishayee, A., R. Karmakar, A. Mandal, S.N. Kundu, and M. Chatterjee. 1997. Vanadium-mediated chemoprotection against chemical hepatocarcinogenesis in rats: haematological and histological characteristics. *Eur. J. Cancer Prev*. 6(1): 58-70.

Boffetta, P. 1993. Carcinogenicity of trace elements with reference to evaluations made by the International Agency for Research on Cancer. *Scand. J. Work Environ. Health*. 19(suppl. 1):67-70.

Byrne, A.R., and L. Kosta. 1978. Vanadium in foods and in human body fluids and tissues. *Sci. Total. Environ.* 10:17-30. (as cited in French and Jones 1992).

Calabrese, E.J., and E.M. Kenyon. 1991. *Air Toxics and Risk Assessment.* Lewis, Chelsea, Michigan.

Curran, G.L., D.L. Azarnoff, and R.E. Bolinger. 1959. Effect of cholesterol synthesis inhibition in nomocholesteremic young men. *J. Clin. Invest.* 38:1251-1261. (as cited in French and Jones 1992).

Dimond, E.G., J. Caravaca, and A. Benchimol. 1963. Vanadium: Excretion, toxicity, lipid effect in man. *Am. J. Clin. Nutr.* 12:49-53. (as cited in ATSDR 1990).

Ding, M., J.-J. Li, S.S. Leonard, J.-P. Ye, X. Shi, N.H. Colburn, V. Castranova, and V. Vallyathan. 1999. Vanadate-induced activation of activator protein-1: Role of reactive oxygen species. *Carcinogenesis* (Oxford) 20: 663-668.

Domingo, J.L., J.M. Llobet, J.M. Tomas, et al. 1985. Short-term toxicity studies of vanadium in rats. *J. Appl. Toxicol.* 5:418-421. (as cited in ATSDR 1990)

French, R.J., and P.J.H. Jones. 1992. Role of vanadium in nutrition: Metabolism, essentiality and dietary considerations. *Life Sci.* 52:339-346.

Hanauske, U., A.-R. Hanauske, M.H. Marshall, et al. 1987. Biphasic effect of vanadium salts on in vitro tumor colony growth. *Int. J. Cell Cloning* 5:170-178.

ICRP (International Commission on Radiological Protection). 1960. *Report of Committee II on Permissible Dose for Internal Radiation* (1959). Recommendations of the International Commission on Radiological Protection, ICRP Publication No. 2. Pergamon Press, Oxford, England. (as cited in WHO 1988).

IPCS (International Programme on Chemical Safety). l988. *Vanadium*. Environmental Health Criteria No. 81. World Health Organization, Geneva.

Kada, T., K. Hirano, and Y. Shirasu. 1980. Screening of environmental chemical mutagens by the *rec*-assay system with *Bacillus subtilis*. *Chemical Mutagens* 6:149-173.

Kanematsu, N., M. Hara, and T. Kada. 1980. *Rec*-assay and mutagenicity studies on metal compounds. *Mutat. Res.* 77: 109-116.

Kerckaert, G.A., R.A. LeBoeuf, and R.J. Isfort. 1996. Use of the Syrian hamster embryo cell transformation assay for determining the carcinogenic potential of heavy metal compounds. *Fundam. Appl. Toxicol.* 34: 67-72.

Leonard, A., and G.B. Gerber. 1994. Mutagenicity, carcinogenicity and teratogenicity of vanadium compounds. *Mutat. Res.* 317:81-88

Llobet, J.M., and J.L. Domingo. 1984. Acute toxicity of vanadium compounds in rats and mice. *Toxicol. Lett.* 23:227-231.

Mongold, J.J., G.H. Cros, L. Vian, A. Tep, S. Ramanadham, G. Siou, J. Diaz, J.H. McNeill, and J.J. Serrano. 1990. *Pharmacol. Toxicol.* 67:192-198. (as cited in French and Jones 1992).

Nechay, B.R., L.B. Nanninga, P.S.E. Nechay, et al. 1986. *Fed. Proc.* 45:123-132. (as cited in French and Jones 1992; Nielsen 1994).

Nielsen, F.H. 1994. Ultratrace minerals. In: *Modern nutrition in health and disease, eighth edition, volume 1.* (M.E. Shils, J.A. Olson, and M. Shike, eds.). Lea & Febiger, Malvern, PA.

Patterson, B.W., S.L. Hansard II, C.B. Ammerman, P.R. Henry, L.A. Zech, and W.R. Fisher. 1986. Kinetic model of whole-body vanadium metabolism: Studies in sheep. *Am. J. Physiol.* 241:R325-R332. (as cited in French and Jones 1992).

Pazynich, V.M. 1966. Experimental data for hygienic determination of the maximum permissible concentration of vanadium pentoxide in the air. *Gig. Sanit.* 31:8-12. (as cited by Calabrese and Kenyon [1991] who cite NIOSH [1977]).

Roshchin, A.V., E.K. Ordzhonikidze, and I.V. Shalvanova. 1980. Vanadium-Toxicity, metabolism, carrier state. *J. Hyg. Epidemiol. Microbiol. Immunol.* 24:3770383. (as cited in WHO 1988).

Schroeder, H.A., and J.J. Balassa. 1967. Arsenic, germanium, tin and vanadium in mice: Effects on growth, survival and tissue levels. *J. Nutr.* 92:245-252.

Schroeder, J.A., M. Mitchener, and A.P. Nasan. 1970. Zirconium, niobium, antimony, vanadium, and lead in rats: Life term studies. *J. Nutr.* 100:59-68.

Smith, J.B. 1983. Vanadium ions stimulated DNA synthesis in Swiss mouse 3T3 and 3T6 cells. *Proc. Natl. Acad. Sci.* 80:61623-6166.

Sora, S., M.L.A. Carbone, M. Pacciarini, et al. 1986. Disomic and diploid meiotic products induced in *Saccharomyces cerevisiae* by the salts of 27 elements. *Mutagenesis* 1:21-28.

Stokinger, H.E., W.D. Wagner, J.T. Mountain, F.R. Stockell, O.J. Dobrogorski, and R.G. Keenan. 1967. Cited in Vanadium V. In: *Patty's Industrial Hygiene and Toxicology, 3rd revised edition.* (G.D. Clayton and F.E. Clayton, eds.). Wiley Interscience, New York. pp. 2013-2033. (as cited in WHO 1988).

Susic, D., and D. Kentera. 1986. Effect of chronic vanadate administration on pulmonary circulation in the rat. *Respiration* 49:68-72.

USEPA (U.S. Environmental Protection Agency). 1977. *Scientific and Technical Assessment Report on Vanadium*. Report No. EPA-600/6-77-002. USEPA, Washington, D.C. (as cited in WHO 1988).

USEPA (U.S. Environmental Protection Agency). 2010. Integrated Risk Information System (IRIS) database maintained on the Internet at http://www.epa/gov/iris by USEPA Environmental Criteria and Assessment Office, Cincinnati

APPENDIX F:

CALCULATIONS

SAMPLE CALCULATION FOR OSPREY
TRIBUTYLTIN SEDIMENT DOSE CALCULATION USING SEDIMENT TO BIOTA FACTORS
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{SOIL\text{-}SED} \times BAcF_{SED\text{-}BENTHOS} \times IR_{FOOD})$$

STEP 4.

$$D_{TOTAL} = (0.019 \text{ mg/kg-dry wt.} \times 0.00105 \text{ g /g-day}) + (0 \text{ mg/L} \times 0.052 \text{ g/g-day}) + (0.019 \text{ mg/kg-dry wt.} \times 1.21 \text{ mg/kg –wet wt.} \times 0.21 \text{ g/g-day})$$

STEP 5.

$$D_{TOTAL} = (0.00001995 \text{ mg/kg-day}) + (0 \text{ mg/kg-day}) + (0.0048279 \text{ mg/kg-day})$$

STEP 6.

$$D_{TOTAL} = 4.85\times10^{-3} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (4.16×10^{-3} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.0000171 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.0041382 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (0.019 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of food on a wet weight basis (0.019 mg/kg-dry wt. x 1.21 mg/kg-wet wt. = 0.02299 mg/kg-wet wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)
$BAcF_{SED\text{-}BENTHOS}$	=	Percentage of total chemical concentration in sediment on a wet weight basis expected to be found in invertebrate food item tissue on a wet weight basis (1.21 mg/kg-wet wt.)

Figure 1. Sample Food Web Calculation for Osprey Exposures to Coke Point Offshore Area Sediments

SAMPLE CALCULATION FOR OSPREY
CADMIUM SEDIMENT DOSE CALCULATION USING BENTHIC TISSUE
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{SOIL\text{-}SED} \times SEDBAF \times IR_{FOOD})$$

STEP 4.

$$D_{TOTAL} = (2.97 \text{ mg/kg-dry wt.} \times 0.00105 \text{ g /g-day}) + (0.0 \text{ mg/L} \times 0.052 \text{ g/g-day}) + (2.97 \text{ mg/kg-dry wt.} \times 0.00776 \text{ mg/kg –wet wt} \times 0.21 \text{ g/g-day})$$

STEP 5.

$$D_{TOTAL} = (0.0031185 \text{ mg/kg-day}) + (0.0 \text{ mg/kg-day}) + (0.0048399 \text{ mg/kg-day})$$

STEP 6.

$$D_{TOTAL} = 7.96\text{x}10^{-3} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day ($6.82\text{x}10^{-3}$ mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.002673 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.0041485 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in benthos in milligrams of chemical per kilogram of soil on a dry weight basis (2.97 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of clam/worm on a dry weight basis (2.97 mg/kg-dry wt. x 0.00776 mg/kg-wet wt. = 43.896 mg/kg-dry wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)
SEDBAF	=	Percentage of total chemical concentration in sediment on a wet weight basis expected to be found in invertebrate food item tissue on a wet weight basis (0.00776 mg/kg-wet wt.)

Figure 2. Sample Food Web Calculation for Osprey Exposures to Coke Point Offshore Area Sediments through Benthic Tissue

SAMPLE CALCULATION FOR OSPREY
CHROMIUM SEDIMENT DOSE CALCULATION USING CRAB TISSUE
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (236 \text{ mg/kg-dry wt.} \times 0.00105 \text{ g /g-day}) + (0.0037 \text{ mg/L} \times 0.052 \text{ g/g-day}) + (0.196 \text{ mg/kg-wet wt.} \times 0.21 \text{ g/g-day})$$

STEP 4.

$$D_{TOTAL} = (0.2478 \text{ mg/kg-day}) + (0.0001924 \text{mg/kg-day}) + (0.04116 \text{ mg/kg-day})$$

STEP 5.

$$D_{TOTAL} = 2.89 \times 10^{-1} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (2.48×10^{-1} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.2124 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0001924mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.03528 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in crab in milligrams of chemical per kilogram of soil on a dry weight basis (236 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0037 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of crab on a wet weight basis (0.196 mg/kg-wet wt.)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)

Figure 3. Sample Food Web Calculation for Osprey Exposures to Coke Point Offshore Area Sediments through Crab Tissue

SAMPLE CALCULATION FOR OSPREY
ARSENIC SURFACE WATER DOSE CALCULATION USING FISH TISSUE
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (27.6 \text{ mg/kg-dry wt.} \times 0.00105 \text{ g /g-day}) + (0.00438 \text{ mg/L} \times 0.052 \text{ g/g-day}) + (0.666 \text{ mg/kg-wet wt.} \times 0.21 \text{ g/g-day})$$

STEP 4.

$$D_{TOTAL} = (0.02898 \text{ mg/kg-bw day}) + (0.0002278 \text{mg/kg-bw day}) + (0.13986 \text{ mg/kg-bw day})$$

STEP 5.

$$D_{TOTAL} = 1.69 \times 10^{-1} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (1.45×10^{-1} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.02484 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0002278 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.11988 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (27.6 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.00438 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of fish on a wet weight basis (0.666 mg/kg-wet wt.)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)

Figure 4. Sample Food Web Calculation for Osprey Exposures to Coke Point Offshore Area Surface Water through Fish Tissue

SAMPLE CALCULATION FOR RIVER OTTER
BENZENE SURFACE WATER DOSE CALCULATION USING SURFACE WATER TO BIOTA FACTORS
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{WATER} \times BAcF_{SW\text{-}BENTHOS} \times IR_{FOOD})$$

STEP 4.

$$D_{TOTAL} = (0.079 \text{ mg/kg-dry wt.} \times 0.0032 \text{ kg/kg-day}) + (0.0125 \text{ mg/L} \times 0.081 \text{ L/kg-day}) + (0.0125 \text{ mg/kg-dry wt.} \times 11.8 \text{ mg/kg –wet wt.} \times 0.64 \text{ kg/kg-day})$$

STEP 5.

$$D_{TOTAL} = (0.0002528 \text{ mg/kg-day}) + (0.0010125 \text{ mg/kg-day}) + (0.0944 \text{ mg/kg-day})$$

STEP 6.

$$D_{TOTAL} = 9.56 \times 10^{-2} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (5.18×10^{-2} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.0002528 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0010125 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.05056 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (0.079 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0125 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of food on a wet weight basis (0.079 mg/kg-dry wt. x 1.0 mg/kg-wet wt. = 0.079 mg/kg-wet wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in kilograms consumed on a dry weight basis kilogram of body weight per day (0.0032 kg /kg-day)
IR_{WATER}	=	Ingestion rate of water in liters of water per kilogram of body weight per day (0.081 L/kg-day)
IR_{FOOD}	=	Ingestion rate of food in kilograms of food on a wet weight basis per kilogram of body weight per day (0.64 kg/kg-day)
$BAcF_{SW\text{-}BENTHOS}$	=	Percentage of total chemical concentration in sediment on a wet weight basis expected to be found in invertebrate food item tissue on a wet weight basis (1.00 mg/kg-wet wt. (default value))

Figure 5. Sample Food Web Calculation for River Otter Exposures to Coke Point Offshore Area Surface Water

SAMPLE CALCULATION FOR RIVER OTTER
ZINC SEDIMENT DOSE CALCULATION USING BENTHOS TO BIOTA FACTORS
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{SOIL\text{-}SED} \times SEDBAF \times IR_{FOOD})$$

STEP 4.

$$D_{TOTAL} = (999 \text{ mg/kg-dry wt.} \times 0.0032 \text{ kg/kg-day}) + (0.0164 \text{ mg/L} \times 0.081 \text{ L/kg-day}) + (999 \text{ mg/kg-dry wt.} \times 0.0245 \text{ mg/kg-wet wt.} \times 0.64 \text{ kg/kg-day})$$

STEP 5.

$$D_{TOTAL} = (3.1968 \text{ mg/kg-day}) + (0.0013284 \text{ mg/kg-day}) + (15.66432 \text{ mg/kg-day})$$

STEP 6.

$$D_{TOTAL} = 18.86 \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (18.86 mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (3.1968 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0013284 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (15.66432 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (999 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0164 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of clam/worm on a wet weight basis (999 mg/kg-dry wt. x 0.0245 mg/kg-wet wt. = 24.4755 mg/kg-wet wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in kilograms consumed on a dry weight basis kilogram of body weight per day (0.0032 kg /kg-day)
IR_{WATER}	=	Ingestion rate of water in liters of water per kilogram of body weight per day (0.081 L/kg-day)
IR_{FOOD}	=	Ingestion rate of food in kilograms of food on a wet weight basis per kilogram of body weight per day (0.64 kg/kg-day)
SEDBAF	=	Percentage of total chemical concentration in sediment on a wet weight basis expected to be found in invertebrate food item tissue on a wet weight basis (0.0245 mg/kg-wet wt.)

Figure 6. Sample Food Web Calculation for River Otter Exposures to Coke Point Offshore Area Sediments through Benthic Tissue

SAMPLE CALCULATION FOR RIVER OTTER
MERCURY SEDIMENT DOSE CALCULATION USING CRAB TO BIOTA FACTORS
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (0.686 \text{ mg/kg-dry wt.} \times 0.0032 \text{ kg/kg-day}) + (0.0000573 \text{ mg/L} \times 0.081 \text{ L/kg-day}) + (0.0191 \text{ mg/kg-wet wt.} \times 0.64 \text{ kg/kg-day})$$

STEP 4.

$$D_{TOTAL} = (0.0021952 \text{ mg/kg-day}) + (0.000004641 \text{mg/kg-day}) + (0.012224 \text{ mg/kg-day})$$

STEP 5.

$$D_{TOTAL} = 1.44 \times 10^{-2} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (1.44×10^{-2} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.0021952 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.000004641 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.012224 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (0.686 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0000573 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of crab on a wet weight basis (0.0191 mg/kg-wet wt.)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in kilograms consumed on a dry weight basis kilogram of body weight per day (0.0032 kg /kg-day)
IR_{WATER}	=	Ingestion rate of water in liters of water per kilogram of body weight per day (0.081 L/kg-day)
IR_{FOOD}	=	Ingestion rate of food in kilograms of food on a wet weight basis per kilogram of body weight per day (0.64 kg/kg-day)

Figure 7. Sample Food Web Calculation for River Otter Exposures to Coke Point Offshore Area Sediments through Crab Tissue

SAMPLE CALCULATION FOR RIVER OTTER
LEAD SURFACE WATER DOSE CALCULATION USING FISH TO BIOTA FACTORS
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (351 \text{ mg/kg-dry wt.} \times 0.0032 \text{ kg /kg-day}) + (0.000193 \text{ mg/L} \times 0.081 \text{ L/kg-day}) + (0.774 \text{ mg/kg-wet wt.} \times 0.64 \text{ kg/kg-day})$$

STEP 4.

$$D_{TOTAL} = (1.1232 \text{ mg/kg-bw day}) + (0.00001563 \text{ mg/kg-bw day}) + (0.49536 \text{ mg/kg-bw day})$$

STEP 5.

$$D_{TOTAL} = 1.62 \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (1.62 mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (1.1232 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.00001563 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.49536 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in soil or sediment in milligrams of chemical per kilogram of soil on a dry weight basis (351 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.000193 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of fish on a wet weight basis (0.774 mg/kg-wet wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in kilograms consumed on a dry weight basis kilogram of body weight per day (0.0032 g /g-day)
IR_{WATER}	=	Ingestion rate of water in liters of water per kilogram of body weight per day (0.081 L/kg-day)
IR_{FOOD}	=	Ingestion rate of food in kilograms of food on a wet weight basis per kilogram of body weight per day (0.64 kg/kg-day)

Figure 8. Sample Food Web Calculation for River Otter Exposures to Coke Point Offshore Area Surface Water through Fish Tissue

SAMPLE CALCULATION FOR HERON
CHROMIUM SEDIMENT DOSE CALCULATION USING CRAB TISSUE
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (27.6 \text{ mg/kg-dry wt.} \times 0.0009 \text{ g /g-day}) + (0.00438 \text{ mg/L} \times 0.045 \text{ g/g-day}) + (1.22 \text{ mg/kg-wet wt.} \times 0.18 \text{ g/g-day})$$

STEP 4.

$$D_{TOTAL} = (0.0248 \text{ mg/kg-day}) + (0.000197 \text{mg/kg-day}) + (0.2196 \text{ mg/kg-day})$$

STEP 5.

$$D_{TOTAL} = 2.44 \times 10^{-1} \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (2.48×10^{-1} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.2124 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0001924mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.03528 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in crab in milligrams of chemical per kilogram of soil on a dry weight basis (236 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0037 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of crab on a wet weight basis (0.196 mg/kg-wet wt.)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)

Figure 9. Sample Food Web Calculation for Heron Exposures to Coke Point Offshore Area Sediments through Crab Tissue

SAMPLE CALCULATION FOR RACOON
CHROMIUM SEDIMENT DOSE CALCULATION USING BENTHIC TISSUE
REASONABLE MAXIMUM SCENARIO

STEP 1.

$$D_{TOTAL} = D_{SOIL\text{-}SED} + D_{WATER} + D_{FOOD}$$

STEP 2.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{FOOD} \times IR_{FOOD})$$

STEP 3.

$$D_{TOTAL} = (C_{SOIL\text{-}SED} \times IR_{SOIL\text{-}SED}) + (C_{WATER} \times IR_{WATER}) + (C_{SOIL\text{-}SED} \times SEDBAF \times IR_{FOOD})$$

STEP 4.

$$D_{TOTAL} = (236 \text{ mg/kg-dry wt.} \times 0.0034 \text{ g /g-day}) + (0.0037 \text{ mg/L} \times 0.083 \text{ g/g-day}) + (236 \text{ mg/kg-dry wt.} \times 0.0047 \text{ mg/kg –wet wt} \times 0.68 \text{ g/g-day})$$

STEP 5.

$$D_{TOTAL} = (0.8024 \text{ mg/kg-day}) + (0.0 \text{ mg/kg-day}) + (0.7543 \text{ mg/kg-day})$$

STEP 6.

$$D_{TOTAL} = 1.55 \text{ mg/kg-bw day}$$

VARIABLE DEFINITIONS

D_{TOTAL}	=	Total ingested dose in milligrams of chemical per kilogram of body weight per day (6.82×10^{-3} mg/kg-bw day)
$D_{SOIL\text{-}SED}$	=	Ingested dose from soil/sediment in milligrams of chemical per kilogram of body weight per day (0.002673 mg/kg-day)
D_{WATER}	=	Ingested dose from water in milligrams of chemical per kilogram of body weight per day (0.0 mg/kg-day)
D_{FOOD}	=	Ingested dose from food in milligrams of chemical per kilogram of body weight per day (0.0041485 mg/kg-day)
$C_{SOIL\text{-}SED}$	=	Chemical concentration in benthos in milligrams of chemical per kilogram of soil on a dry weight basis (2.97 mg/kg-dry wt.)
C_{WATER}	=	Chemical concentration in water in milligrams of chemical per liter of water (0.0 mg/L)
C_{FOOD}	=	Concentration in food in milligrams of chemical per kilogram of clam/worm on a dry weight basis (2.97 mg/kg-dry wt. x 0.00776 mg/kg-wet wt. = 43.896 mg/kg-dry wt)
$IR_{SOIL\text{-}SED}$	=	Ingestion rate of soil or sediment in grams consumed on a dry weight basis gram of body weight per day (0.0009 g /g-day)
IR_{WATER}	=	Ingestion rate of water in grams of water per gram of body weight per day (0.052 g/g-day)
IR_{FOOD}	=	Ingestion rate of food in grams of food on a wet weight basis per gram of body weight per day (0.18 g/g-day)
SEDBAF	=	Percentage of total chemical concentration in sediment on a wet weight basis expected to be found in invertebrate food item tissue on a wet weight basis (0.00776 mg/kg-wet wt.)

Figure 10. Sample Food Web Calculation for Racoon Exposures to Coke Point Offshore Area Sediments through Benthic Tissue

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL CANCER RISKS FROM BENZO(A)PYRENE
SEDIMENT DERMAL EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Risk} = \text{LADI} \times \text{SF}$$

STEP 2.

$$\text{Risk} = \left(\frac{\text{EPC x IF x EF x ED x RAF}}{\text{BW x AT}} \times \text{CF} \right) \text{x SF x MF}$$

STEP 3.

$$\text{Risk} = \left(\frac{\text{EPC x (SA x AF) x EF x ED x RAF}}{\text{BW x AT}} \times \text{CF} \right) \text{x SF x MF}$$

STEP 4.

$$\text{Risk} = \left(\frac{(12.5\ \text{mg/kg}) \text{ x } (3{,}870\ \text{cm}^2\text{/event x } 0.20\ \text{mg/cm}^2) \text{ x } (32\ \text{events/yr}) \text{ x } (10\text{yrs}) \text{ x } (0.13)}{(45\ \text{kg}) \text{ x } (25{,}550\ \text{days})} \times (1.0^{-6}\ \text{kg/mg}) \right) \text{ x } 7.3 \text{ per mg/kg-day x } 3$$

STEP 5.

$$\text{Risk} = (3.50 \text{ x } 10^{-7}\ \text{mg/kg-day}) \text{ x } 21.9 \text{ per mg/kg-day}$$

STEP 6.

$$\text{Risk} = 7.69 \text{ x } 10^{-6}$$

VARIABLE DEFINITIONS

LADI	=	Lifetime cancer average daily intake (mg/kg bw-day)
Risk	=	Unitless probability of an exposed individual developing cancer
MF	=	Mutagenic factor, applicable to receptors <16 years of age
SF	=	Cancer slope factor $(\text{mg/kg bw-day})^{-1}$
EPC	=	COPC concentration in a specific medium (mg/kg or mg/L)
IF	=	Intake factor (mg/day, L/day, or mg/meal)
SA	=	Surface area for contact (cm^2/event)
AF	=	Adherence factor (mg/cm^2)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
RAF	=	Relative absorption factor (unitless)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (1^{-6} kg/mg)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 11. Calculation of Chemical Cancer Risks from Coke Point Offshore Area Sediments (Dermal Contact)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL CANCER RISKS FROM DIOXIN (TEQ)
CRAB/FISH INGESTION EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Risk} = \text{LADI} \times \text{SF}$$

STEP 2.

$$\text{Risk} = \left(\frac{\text{EPC x IF x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \text{ x SF}$$

STEP 3.

$$\text{Risk} = \left(\frac{\text{[EPC x CR x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \text{ x SF}$$

STEP 4.

$$\text{Risk} = \left(\frac{[(6.09\text{x}10^{-6}\ \text{mg/kg}) \text{ x } (0.170\ \text{kg/meal}) \text{ x } (16\ \text{meals/yr}) \text{ x } (10\text{yrs})}{(45\ \text{kg}) \text{ x } (25{,}550\ \text{days})} \times (1.0\ \text{kg/kg}) \right) \text{ x SF}$$

STEP 5.

$$\text{Risk} = (1.44 \text{ x } 10^{-10}\ \text{mg/kg-day}) \text{ x } 1.3\text{x}10^{5} \text{ per mg/kg-day}$$

STEP 6.

$$\text{Risk} = 1.87 \text{ x } 10^{-5}$$

VARIABLE DEFINITIONS

LADI	=	Lifetime cancer average daily intake (mg/kg bw-day)
Risk	=	Unitless probability of an exposed individual developing cancer
SF	=	Cancer slope factor $(\text{mg/kg bw-day})^{-1}$
EPC	=	COPC concentration in a specific medium (mg/kg dry wt.)
IF	=	Intake factor (mg/day, L/day, or mg/meal)
CR	=	Ingestion rate (kg dry wt./meal)
EF	=	Exposure frequency (meals/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (1.0 kg/kg)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 12. Calculation of Chemical Cancer Risks from Coke Point Offshore Area Crab/Fish Tissue (Ingestion)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL CANCER RISKS FROM BENZO(K)FLUORANTHENE
CRAB/FISH INGESTION EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Risk} = \text{LADI} \times \text{SF}$$

STEP 2.

$$\text{Risk} = \left(\frac{\text{EPC x IF x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \text{ x SF x MF}$$

STEP 3.

$$\text{Risk} = \left(\frac{\text{EPC x CR x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \text{ x SF x MF}$$

STEP 4.

$$\text{Risk} = \left(\frac{(5.95\text{x}10^{-1}\ \text{mg/kg}) \text{ x } (0.170\ \text{kg/meal}) \text{ x } (16\ \text{meals/yr}) \text{ x } (10\text{yrs})}{(45\ \text{kg}) \text{ x } (25{,}550\ \text{days})} \times (1.0\ \text{kg/kg}) \right) \text{ x } 7.3\ \text{x}10^{-2} \text{ per mg/kg-day x } 3$$

STEP 5.

$$\text{Risk} = (1.41 \text{ x } 10^{-5}\ \text{mg/kg-day}) \text{ x } 7.3\ \text{x}10^{-2} \text{ per mg/kg-day x } 3$$

STEP 6.

$$\text{Risk} = 3.08 \text{ x } 10^{-6}$$

VARIABLE DEFINITIONS

LADI	=	Lifetime cancer average daily intake (mg/kg bw-day)
Risk	=	Unitless probability of an exposed individual developing cancer
SF	=	Cancer slope factor $(\text{mg/kg bw-day})^{-1}$
EPC	=	COPC concentration in a specific medium (mg/kg dry wt.)
MF	=	Mutagenic factor, applicable to receptors <16 years of age
IF	=	Intake factor (mg/day, L/day, or mg/meal)
CR	=	Ingestion rate (kg dry wt./meal)
EF	=	Exposure frequency (meals/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (1.0 kg/kg)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 13. Calculation of Chemical Cancer Risks from Coke Point Offshore Area Crab/Fish Tissue (Ingestion-Mutagenic)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL NON-CANCER RISKS FROM SELENIUM
SURFACE WATER INGESTION EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Hazard Quotient} = \text{CDI} / \text{RfD}$$

STEP 2.

$$\text{Hazard Quotient} = \left(\frac{\text{EPC x IF x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \ / \ \text{RfD}$$

STEP 3.

$$\text{Hazard Quotient} = \left(\frac{\text{EPC x (CR x ET) x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) \ / \ \text{RfD}$$

STEP 4.

$$\text{Hazard Quotient} = \left(\frac{(1.35^{-2}\ \text{mg/L}) \text{ x } (0.005\ \text{L/hr x 2 hrs/day}) \text{ x } (32\ \text{days/yr}) \text{ x } (10\text{yrs})}{(45\ \text{kg}) \text{ x } (3{,}650\ \text{days})} \right) \ / \ 0.005\ \text{mg/kg-day}$$

STEP 5.

$$\text{Hazard Quotient} = (2.63 \text{ x } 10^{-7}\ \text{mg/kg-day}) \ / \ 0.005\ \text{mg/kg-day}$$

STEP 6.

$$\text{Hazard Quotient} = 5.25 \text{ x } 10^{-5}$$

VARIABLE DEFINITIONS

CDI	=	Chronic Daily Intake (mg/kg bw-day)
Hazard Quotient	=	Unitless probability of an exposed individual developing cancer
RfD	=	Reference Dose (mg/kg bw-day)
EPC	=	COPC concentration in surface water (mg/L)
IF	=	Intake factor (mg/day, L/day, or mg/meal)
CR	=	Ingestion rate (L/hr)
ET	=	Exposure time (hrs/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 14. Calculation of Chemical Non-Cancer Risks from Coke Point Offshore Area Surface Water (Ingestion, Inorganics)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL NON-CANCER RISKS FROM SELENIUM
SURFACE WATER DERMAL EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Hazard Quotient} = \text{CDI} / \text{RfD}$$

STEP 2.

$$\text{Hazard Quotient} = \left(\frac{\text{EPC x IF x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) / \text{RfD}$$

STEP 3.

$$\text{Hazard Quotient} = \left(\frac{\text{EPC x (SA x ET x PC) x EF x ED}}{\text{BW x AT}} \times \text{CF} \right) / \text{RfD}$$

STEP 4.

$$\text{HQ} = \left(\frac{(1.35^{-2}\ \text{mg/L}) \text{ x } (13{,}350\ \text{cm}^2 \text{ x } 2\ \text{hrs/day x } 9.03\text{x}10^{-4}\ \text{cm/hr}) \text{ x } (32\ \text{days/yr}) \text{ x } (10\text{yrs})}{(45\ \text{kg}) \text{ x } (3{,}650\ \text{days})} \times (1.0^{-3}\ \text{L/cm}^3) \right) / 0.005\ \text{mg/kg-day}$$

STEP 5.

$$\text{Hazard Quotient} = (6.34 \text{ x } 10^{-7}\ \text{mg/kg-day}) \ / \ 0.005\ \text{mg/kg-day}$$

STEP 6.

$$\text{Hazard Quotient} = 1.27 \text{ x } 10^{-4}$$

VARIABLE DEFINITIONS

CDI	=	Chronic Daily Intake (mg/kg bw-day)
Hazard Quotient	=	Unitless probability of an exposed individual developing cancer
RfD	=	Reference Dose (mg/kg bw-day)
EPC	=	COPC concentration in surface water (mg/L)
IF	=	Intake factor (mg/day, L/day, or mg/meal)
SA	=	Surface area for contact (cm^2)
ET	=	Exposure time (hrs/day)
PC	=	Permeability coefficient (cm/hr)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)
CF	=	Conversion Factor (1^{-3} L/cm^3)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 15. Calculation of Chemical Non-Cancer Risks from Coke Point Offshore Area Surface Water (Dermal Contact, Inorganics)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF CHEMICAL NON-CANCER RISKS FROM BENZENE
SURFACE WATER DERMAL EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1.

$$\text{Hazard Quotient} = \text{CDI} / \text{RfD}$$

STEP 2.

$$\text{Hazard Quotient} = \left(\frac{DA_{event} \times SA \times EF \times ED}{BW \times AT} \times CF \right) / \text{RfD}$$

STEP 3.

$$\text{Hazard Quotient} = \left(\frac{(4.7\text{x}10^{-7}\ \text{mg/cm - event}) \times (13{,}350\ \text{cm}^2) \times (32\ \text{days/yr}) \times (10\text{yrs})}{(45\ \text{kg}) \times (3{,}650\ \text{days})} \times (1.0^{-3}\ \text{L/cm}^3) \right) / 0.004\ \text{mg/kg-day}$$

STEP 4.

$$\text{Hazard Quotient} = (1.22 \times 10^{-5}\ \text{mg/kg-day}) / 0.004\ \text{mg/kg-day}$$

STEP 5.

$$\text{Hazard Quotient} = 3.05 \times 10^{-3}$$

VARIABLE DEFINITIONS

CDI	=	Chronic Daily Intake (mg/kg bw-day)
Hazard Quotient	=	Unitless probability of an exposed individual developing cancer
RfD	=	Reference Dose (mg/kg bw-day)
DA_{event}	=	Absorbed Dose (mg/kg-day), Calculated in Figure 15
SA	=	Surface area for contact (cm^2)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

1. The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Figure 16 Calculation of Chemical Non-Cancer Risks from Coke Point Offshore Area Surface Water (Dermal Contact, Organics)

SAMPLE CALCULATION FOR ADOLESCENT RECREATIONAL USER
CALCULATION OF DA_{event} FROM BENZENE
SURFACE WATER DERMAL EXPOSURE- REASONABLE MAXIMUM SCENARIO

STEP 1. $B = \left(PC \sqrt{\frac{MW}{2.6}} \right) = \left(1.5\text{x}10^{-2}\ \text{cm/hr} \sqrt{\frac{78.10\ \text{g/mole}}{2.6}} \right) = 5.1\text{x}10^{-2}$

Scenario 1. $B \leq 0.6 \quad t^* = 2.4(\tau_{event})$

Scenario 2. $B > 0.6 \quad t^* = \left(6(\tau_{event}) \text{ x } (b - \sqrt{b^2 - c^2} \right)$

STEP 2. $t^* = 2.4 \text{ x } 2.88\text{x}10^{-1}$

Scenario 1. $t_{event} \leq t^*$

$$DA_{event} = \left((2FA) \text{ x } PC \text{ x } EPC \text{ x } \sqrt{\frac{6\tau_{event} \text{ x } t_{event}}{\pi}} \right)$$

Scenario 2. $t_{event} > t^*$

$$DA_{event} = \left(FA \text{ x } PC \text{ x } EPC \text{ x } \left[\frac{t_{event}}{1+B} + 2\tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \right)$$

STEP 3. 2 hours > 0.961 hr

STEP 4.

$$DA_{event} = \left(1 \text{ x } 1.5\text{x}10^{-2}\ \text{cm/hr} \text{ x } 12.5\ \text{ug/L} \text{ x } \left[\frac{2\ \text{hr}}{1+0.051} + 2(2.88\text{x}10^{-1}) \left(\frac{1+3(0.051)+3(0.051)^2}{(1+0.051)^2} \right) \right] \right) = 4.7\text{x}10^{-7}$$

VARIABLE DEFINITIONS

B	=	Ratio of the permeability coefficient through the stratum corneum relative to the viable epidermis (dimensionless)
PC	=	Permeability Coefficient (cm/hr)
MW	=	Molecular Weight (g/mole)
t*	=	Time to reach steady-state (hr)
τ_{event}	=	Lag time per event (hr/event) (0.105 x10^(0.0056 *MW))
DA_{event}	=	Absorbed Dose (mg/kg-day)
FA	=	Fraction absorbed (uniteless) (Chemical-specific)
EPC	=	COPC concentration in a specific medium (mg/L)
SA	=	Surface area for contact (cm^2)
t_{event}	=	Event Duration (hr)
b,c	=	Correlation coefficients calculated from B, used to calculate t* based on Flynn data set (USEPA 2004)

Figure 17. Calculation of DA_{event} from Coke Point Offshore Area Surface Water (Dermal Contact, Benzene)

APPENDIX G:

SENSITIVITY ANALYSIS

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APPENDIX G

SENSITIVITY ANALYSIS FOR THE RISK ASSESSMENT OF THE OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT

BALTIMORE, MARYLAND

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SENSITIVITY ANALYSIS FOR THE RISK ASSESSMENT OF THE OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT, BALTIMORE, MARYLAND

The Risk Assessment of the Coke Point Offshore Areas (Offshore Area) was conducted to characterize the likelihood of potential harm to aquatic organisms, wildlife, and humans who may frequent the area from chemicals in surface sediment, surface water, and tissue. This likelihood is referred to as risk. To characterize risk, the assessment uses quantitative models that simplify exposure and toxicity relationships. Because model calculations simplify real world interactions that are often very complex, it is necessary to make estimates, assumptions, or generalizations regarding exposure and toxicity.

The estimates, assumptions, and generalizations used in this risk assessment are made based on knowledge of the Offshore Area; studies from the scientific literature; and U.S. Environmental Protection Agency (USEPA) guidance designed to ensure consistency and protectiveness. Models and assumptions in the risk assessment were based on information that is technically defensible; however, it is possible that, in some cases, alternate assumptions could have been applied in risk models, and that their selection would have produced different risk results. It is important to quantify the impact that different inputs to exposure and toxicity models would have on risk assessment results. This exercise is referred to as a sensitivity analysis, and provides a context for risk results when more than one set of exposure and toxicity assumptions could be applicable.

The purpose of this sensitivity analysis is to quantify the influence that specific inputs have on risk assessment results. The sensitivity analysis focuses on those inputs for which:

1. Several different sets of assumptions could reasonably have been used to establish input values;
2. Inputs that could potentially have a detectable and potentially substantial influence on model outputs.

These criteria most often apply to inputs that were established based on precautionary regulatory guidance or where site-specific data were lacking. The following five factors were identified as candidates for sensitivity analysis:

1. Estimation of exposure point concentrations (EPCs) for background areas in the Patapsco River;
2. Statistical derivation of EPCs for the Coke Point Offshore Area;
3. Estimation of fish and crab ingestion rates for humans; and
4. Data reduction methods applied to samples where chemicals were not detected.

The sensitivity analysis focuses on chemicals of concern (COCs) in surface sediment and surface water as the primary risk drivers. In most of these cases, there was uncertainty associated with which model inputs would be most relevant to the site, and uncertainties were addressed by defaulting to precautionary assumptions standard to regulatory guidance. While these precautionary assumptions ensure that risk assessment results will be adequately protective of human health and ecological receptors, they may also result in an overestimation of risks. Therefore, the sensitivity analysis includes evaluation of alternate model inputs that are less precautionary to determine whether these significantly alter assessment results.

1.0 PATAPSCO RIVER BACKGROUND EXPOSURE POINT CONCENTRATIONS

The purpose of this risk assessment is to quantitatively evaluate potential risks from exposure to the offshore areas adjacent to the Coke Point Peninsula. Thus, risk results based on nearby samples in the Patapsco River are included as comparison values to provide context, and are not intended as a comprehensive characterization of risks across the full reach of the Patapsco River. The Patapsco River Background samples were collected from areas of the Patapsco River (selected in the risk assessment work plan) that would likely be beyond the influence of Coke Point and representative of regional background conditions for use in drawing relative comparisons to Coke Point data. These included six samples of sediment and nine samples of surface water. The sections below discuss the statistical methods used to summarize background data for use in the risk assessment, how these statistical methods impact results, and the impacts of using alternate statistical methods for analyzing and summarizing background data.

1.1 DERIVATION OF BACKGROUND SURFACE SEDIMENT AND SURFACE WATER EPCS

Background concentrations are defined as widespread chemical concentrations beyond the direct influence of Coke Point chemical sources. The risk assessment identified the area within the direct influence of Coke Point sources as the Coke Point Offshore Area (Offshore Area), and areas beyond its influence as the Patapsco River Background Area. Risk results for the Offshore Area were compared to those for the Background Area as a measure of comparative risk.

To calculate risk estimates for the Patapsco River Background Area, the risk assessment utilized EPCs calculated from six surface sediment samples and nine surface water samples. The number of chemical detections in surface sediment and surface water samples was not sufficient to support calculation of a 95 Percent Upper Confidence Limit of the Mean (95%UCLM) for every chemical, which is typically used as the EPC for reasonable maximum exposure scenarios per USEPA guidance (USEPA 1989), and which was used to derive EPCs for the Coke Point Offshore Area. Where a 95% UCLM could be calculated, these are used as the reasonable maximum exposure EPCs for human health and ecological risk assessment. Where 95% UCLMs could not be calculated, or where 95% UCLMs exceed the maximum detected concentration, the maximum detected concentration is used as a default representation of the reasonable maximum EPC.

Using 95% UCLM that in some cases default to maxima is a valid approach which maintains consistency between the methods used to estimate risks between the two areas assessed (Coke Point Offshore Area and the Patapsco River Background Area). However, there are several

circumstances which contribute uncertainty to the use of this method. First, the sample size of the background data set is often too small to allow calculation of the 95% UCLM. Second, one sample location within the background data set (BH-SED-01) contains concentrations of chemicals – specifically metals and polycyclic aromatic hydrocarbons (PAHs) − that are higher than those detected in any of the other background samples. Third, incorporation of background data into a risk assessment is typically performed with precaution, and use of maxima provides a valid but not precautious measure of background risk for use in comparisons.

Given this uncertainty, sensitivity analysis was performed to provide context for the background EPCs used in the risk assessment through consideration of several values potentially representative of central tendency for background exposures and through consideration of other data from the Patapsco River.

The median was considered as an alternate estimate of central tendency for the background data set. Use of the median provides less weight to high concentrations dissimilar from the majority of sample results. The advantage of using the median concentration is that it may provide precaution in cases where one high concentration dominates the relatively small background data set, which could inflate background risks. One disadvantage is that the median provides a measure of central tendency, and therefore does not estimate the upper bound of background concentrations. Thus comparing upper bounds of risk calculated for the Coke Point Offshore Area with a measure of central tendency for the Patapsco River Background Area is asymmetric and may result in skewed findings that risks are elevated above background. Another disadvantage is that, in the case of surface water, the median sample is sometimes a non-detect; this would result in the use of a reporting limit or method detection limit to represent background concentrations, which is a source of uncertainty.

Comparisons of minimum, maximum, and median detected concentrations of metals and PAHs are presented in **Table 1.1** and **Table 1.2**. As shown in **Table 1.1**, median concentrations in sediment are typically lower than the midpoint between minimum and maximum; this is because most background samples contained concentrations lower than the midpoint. For sediment, all median concentrations are derived from samples where chemicals were detected.

In surface water, there are several cases where the median corresponds to the result from a sample where the chemical was not detected (**Table 1.2**). In these cases, consideration was given to using the maximum reporting limit as the value for the median sample. However, in many cases, the maximum reporting limit was higher than the maximum detected concentrations. For several important COCs, such as benzo(a)pyrene, median concentrations based on reporting limits were three to four times higher than the maximum detected concentration. Therefore, consideration was given to using the maximum Method Detection Limit (MDL) as the value for the median sample. This was found to provide values more in line with the range of detected concentrations. Therefore, where the median of the data set is a non-detect, the maximum MDL was considered in place of the median.

To provide additional context for statistical characterization of surface water background concentrations, data were compiled from the 2008 Baltimore Harbor channel sampling conducted by the U.S. Army Corps of Engineers (EA 2009). Data from 11 surface water

samples, each collected from one of the Harbor channels, were compiled and summarized for metals and PAHs. Data was used from all channels except for the Northwest Branch West and East channels because they are known to be influenced by specific chemical sources and are not considered representative of ambient Patapsco River background conditions. These summarized results are presented in **Table 1.2**. Examination of these data indicate that the 95%UCLM or maximum detected concentration are better representations of regional background than the median.

1.2 IMPLICATIONS OF BACKGROUND EPC DERIVATION ON HUMAN HEALTH RISK RESULTS

Based on the discussion above, the use of median concentrations derived using the MDL is a technically defensible alternative approach, although does present some uncertainties. Because EPCs evaluated for the Coke Point Offshore Area are derived using a 95%UCLM calculated assuming all non-detects are equal to the RL, risks for the Patapsco River Background Area are derived using the same EPC methodology. There may be concerns that the use of a 95%UCLM over-estimates EPCs and results in higher risk levels for the Patapsco River Background Area. However, the use of a median EPC, that takes into account the MDL instead of an RL, results in different methods for deriving EPCs may produce artificially large differences between risk estimates for the Coke Point Offshore Area and the Patapsco River Background Area. Therefore, potential changes in risk results are presented here for comparison purposes. Table 1.3 presents a summary of the carcinogenic risk results for all receptors evaluated in the HHRA. Risk results for the Patapsco River Background Area are presented using both methods for determining EPCs: median using the MDL and 95%UCLM using RLs. Tables 1.4 through 1.15 present the EPC derivation and risk calculations assuming a median as the EPC. Risks are calculated assuming the use of BAFs and not actual field-collected fish tissue concentrations. Table 1.3 reveals that the cumulative carcinogenic risk results for the Patapsco River Background Area are higher based on 95%UCLM using the RL. This decreases the difference between risks for the Patapsco River Background Area and the Coke Point Offshore Area. However, the cumulative carcinogenic risk results for the Coke Point Offshore Area are still higher than those in the Patapsco River Background Area by as much as an order of magnitude. This trend is expected for ecological risk results as well.

1.3 ALTERNATE MEANS OF DERIVING SEDIMENT BACKGROUND EPCS

An additional means of deriving a background EPC for sediment was explored which eliminates uncertainty associated with small sample size by making use of the larger Coke Point Offshore Area data set. The nominal background risk was conducted using the median concentration of the six background samples. A sensitivity analysis was conducted using estimates of the upper range of background concentration called the background threshold value (BTV). The BTV was estimated using the following two methodologies:

1. The maximum detected concentration of the six background samples, and
2. The threshold value from a cumulative frequency distribution of background and onsite samples.

The threshold value from a cumulative frequency distribution is useful in cases where the background data set is limited and the onsite data set is suspected of containing a mixture of background and impacted samples. The use of both data sets together increases the sample size available for evaluation. While the majority of samples in the Coke Point Offshore Area are expected to be impacted by source-related chemicals, there may be some samples representative of background. To identify a potential BTV, the sample results for each COC for both the Coke Point Offshore Area and the Patapsco River Background Area were combined into a single dataset. The values were plotted in a cumulative frequency distribution, which shows the number of observations in a dataset that fall below a given number. The cumulative frequency distribution was then examined by a statistician to identify an inflection point for each chemical that would indicate the threshold between Coke Point Offshore Area values and background values.

The results of the evaluation are presented in Table 1.16. The BTVs presented in this table would theoretically represent the upper extent of the range of background concentrations. These results indicate that the use of median background concentrations as values for comparison in the risk assessment is precautionary. For many chemicals, there is an order of magnitude difference between the maximum background concentrations and the BTV calculated based on combined/pooled data sets. This indicates that actual background concentrations may be elevated above those used to characterize risks associated with the Patapsco River Background Area.

BTVs such as the ones derived here are not typically used to represent background in risk assessment. This is because it is difficult to prove that the data used to derive BTVs (i.e., sediment samples from around Coke Point) are completely beyond the immediate influence of the chemical sources being assessed. Therefore, EPCs in the risk assessment do not incorporate BTV, and BTVs serve primarily to point out that there is uncertainty associated with background concentrations in the Patapsco River.

2.0 COKE POINT OFFSHORE AREA EXPOSURE POINT CONCENTRATIONS

The risk assessment used the 95% upper confidence limit of the mean (UCLM95) as the EPC. The UCLM95 was calculated using USEPA's ProUCL program that calculates UCLMs from sample data with the assumption that samples are independently and identically distributed (i.i.d.) in an exposure area. The i.i.d. assumption may not be realistic for contaminants that exhibit strong spatial dependent variation. Therefore, a sensitivity analysis of the i.i.d. assumption was conducted using a spatial kriging of the contaminants exhibiting the highest ecological and human health risk (i.e., risk driver). The kriging analysis was used to determine both the spatially averaged mean and 95% upper confidence level concentration for each risk driver. Figures 2.1 to 2.15 display maps of chemicals in surface sediment determined by the method of ordinary kriging.

The results of the sensitivity analysis indicate that EPCs derived from 95%UCLM outputs of ProUCL are consistent with those derived using spatially explicit statistics with the exception of low molecular weight (LMW) polycyclic aromatic hydrocarbons (PAHs) (Table 2.1). The 95%UCLM for LMW PAHs from ProUCL is heavily influenced by results at a single sample

point where naphthalene was detected at 7,200 milligrams per kilogram (mg/kg). Concentrations for other samples are an order of magnitude lower, and the geographic area influenced by the single high detect is very small.

The implications of the results above for ecological and human health receptors are that risks from LMW PAHs in the Coke Point Offshore Area are likely biased high due to the influence of one nearshore sampling point.

3.0 FINFISH AND CRAB INGESTION RATES

Finfish and crab ingestion rates in the HHRA were based on a number of assumptions and take into account USEPA and Maryland Department of the Environment (MDE) guidance. However, best professional judgment was used to determine typical exposure patterns for human receptors within the Coke Point Offshore Area. As a result, assumptions about the number of days visited at Coke Point and the resulting number of fish and crab meals were based upon this exposure assumption.

3.1 EXPOSURE ASSUMPTIONS IN COMPARISON TO FISH ADVISORIES

Crab and crab ingestion rates in the HHRA were conservative and assume that recreational users and watermen catch and consume their catch in the Coke Point Offshore Area. However, there are current fishing advisories for the area that were not taken into account in the HHRA. These fish advisories suggest limits on the amount of finfish and crab consumed from the Patapsco River. The HHRA assumes that local recreational users and watermen will not adhere to the fish advisories since the advisories are on a voluntary basis.

The crab and fish ingestion rates utilized took into account USEPA guidance, the Exposure Factors Handbook (EFH) (USEPA 1997). The EFH presents ingestion rates for recreational and subsistence fishermen based on studies and surveys deemed relevant by USEPA. For freshwater/estuarine areas, the weight of fish consumed per day corresponds to assumptions made in the MDE Fish Advisory (MDE 2010). The resulting fish consumed is 0.227 kilograms per meal (kg/meal) (8 ounces/meal) for the watermen and adult recreational user, 0.17 mg/meal (6 ounces/meal) for the adolescent recreational user, and 0.085 kg/meal (3 ounces/meal) for the child recreational user. These ingestion rates were utilized in the HHRA and are consistent with Maryland Fish Advisory assumptions.

The frequency of meals in the HHRA was estimated to be 39 days per year for watermen and 32 days per year for recreational users based upon the estimated number of days spent at the Coke Point Offshore Area. Because the HHRA assumed that both fish and crabs are caught and consumed from the area, the frequency of visits and consumption of catch was divided evenly in the HHRA between finfish and crabs (19.5 meals per year for the watermen and 16 meals per year for each of the recreational users). The HHRA did not make assumptions as to specific species that would be consumed.

In comparison, the MDE Fish Advisory for the area indicates limitations on the number of meals per year for specific species in the Patapsco River. These include American Eel, White Perch,

Brown Bullhead, Channel Catfish, Common Carp, Striped Bass, Small and Largemouth Bass, White Catfish, and Yellow Perch. For several species, the advisory indicates that consumption should be completely avoided in the Patapsco River; these include American Eel, Channel Catfish, and White Catfish. For women of childbearing age and children, Striped Bass and White Perch are to be avoided. Several species have limitations which are less than the number of meals assumed in the HHRA; these species are Brown Bullhead, Common Carp, Striped Bass (excluding women of childbearing age and children), Yellow Perch, and White Perch (excluding women of childbearing age and children).

For the adult and adolescent (not women of childbearing age), the fish advisory limitations range from 7 to 17 meals per year. These limitations are within the 6 to 10 meal per year range for the child, close to half the HHRA ingestion rate. Following the advisories for these species would either eliminate finfish risk or reduce it by up to one half compared to the HHRA assumptions.

For blue crab, the advisory recommends that the general population should only consume 96 meals per year from the Patapsco River/Baltimore Harbor and that the "mustard" should not be consumed at all. Women and children are limited to 72 and 55 meals per year, respectively. Although the HHRA assumption is lower (19.5 meals per year for the watermen and 16 for the recreational user), the HHRA assumes that the crab meat and mustard is consumed. Additionally, the MDE Fish Advisory is for the entire Patapsco River/Baltimore Harbor and would most likely result in a higher catch and consumption rate. The HHRA is specific to the Coke Point Offshore Area and exposure to only this area. Therefore, the number of meals included in the HHRA for crabs is appropriate in comparison to the MDE Fish Advisory. Application of the MDE Fish Advisory to the HHRA exposure parameters would not result in any changes to the risk results.

4.0 DATA REDUCTION FOR NON-DETECTED CHEMICALS

4.1 NON-DETECT SUMMATION GROUP COMPARISON

Four major chemical classes were assessed as summation groups; total HMW PAHs, total LMW PAHs, dioxin toxicity equivalency quotients (TEQs), and total polychlorinated biphenyls (PCBs). There are three different methods that can be used in the summation to represent non-detects:

- Non-detects can be represented as zero concentrations (ND=0), assuming no chemical is present.
- Non-detects can be represented as ½ the detection limit (ND = ½DL), assuming chemical is present at concentrations midway between the detection limit and zero.
- Non-detects can be represented at the detection limit (ND = DL), assuming chemical is present just below detectable levels.

Results for both the ND=0 and ND=DL treatments are presented in the risk assessment; risk assessment conclusions are based on the ND=DL treatment. Different treatments result in

different outcomes of the calculated 95%UCLM. The 95%UCLM is used for the reasonable maximum case scenario in the risk assessment. This sensitivity analysis examines the three different non-detect treatments (ND = 0, ND = ½DL, and ND = DL).

Table 4.1 presents a comparison of the different methods of treating non-detects for summed compounds identified as COCs. With the exception of dioxins, different treatments produce very little or no change in the EPCs used for sediment because very few organic chemicals were not detected. Dioxins as TCDD TEQs change by over a factor of five. However, the different treatments produce a substantial change in the EPCs for surface water. These results appear at first to be counter-intuitive. The 95% UCLM EPC for surface water based on ND=0 is higher than that for ND = ½DL and ND = DL. Examination of these results and input data indicates that the summed concentrations for chemical group tend to be slightly higher for the case where ND=0. However, the zero values cause more variability in the data set. Because many of the chemical detections in the data set are near the detection limit, there is less variability in the ND = ½DL and ND = DL. The greater variability causes the ProUCL software to calculate a higher 95%UCLM for the ND=0 treatments than for the other treatments.

Different treatments also produce a substantial change in the EPCs for field collected tissue with variations of as much as an order of magnitude. This is because many compounds were non-detected in over half of composite tissue samples. It is also because reporting limits for tissues are sometimes higher than detected values. Tissues tend to bind organic compounds such as PAHs and PCBs which are hydrophobic; this makes extraction and analysis of these compounds difficult and influence reporting of results. Where the tissue matrix interferes with the analysis, compounds may be detected at low levels, but the reported concentration is considered an estimate, and the reporting limit is set above the detected value. These high reporting limits have a large impact on the results reported for chemical summations.

In summary, the risk assessment presents results for summed PCBs, PAHs, and dioxins using both the ND=0 and ND=DL treatments for non-detects. There is little difference for sediments for chemicals other than dioxins, but a substantial difference (factor of two to three times) for surface water results. This is largely due to infrequency of detection in surface water. There is also a substantial difference for tissues of as much as an order of magnitude.

5.0 FINDINGS

The conclusion of the sensitivity analysis is that use of precautionary assumptions in the risk assessment is likely to result in an overestimation of numeric estimates of risks but would not change the overall conclusions of the risk assessment. The sensitivity analysis provides the following specific findings:

- Use of 95%UCLM based on RLs to derive sediment and surface water EPCs for background is appropriate. Use of MDLs instead of RLs and use of median concentrations provides a valid if highly precautionary set of alternative EPCs for use in characterizing background risks. Use of medians and MDLs produces background risks which are up to an order of magnitude lower than those presented in the risk assessment; this would make Coke Point risks much higher than background risks.

- Evaluation of Harbor channel surface water data for metals and PAHs indicates that use of 95%UCLM which may default to maxima is a better characterization of background surface water concentrations than medians.
- Calculation of average sediment concentrations in background using data from within the Coke Point Offshore Area using BTVs produces values much higher than those used to represent background in the risk assessment; however, BTVs are not typically used in risk assessment because influence of site-related chemical sources on the overall distribution cannot be ruled out.
- The 95%UCLM EPCs as derived with ProUCL software are comparable to 95%UCLMs produced through spatially explicit statistical analyses for all chemicals but LMW PAHs. This indicates that for most chemicals ProUCL outputs provide a valid if precautionary representation of reasonable maximum exposure. The 95%UCLM produced by ProUCL for LMW PAHs is heavily influenced by a single high detect of naphthalene of limited spatial influence.
- Use of lower intake rates consistent with fish consumption advisories changes findings for consumption of finfish but does not change findings for consumption of crabs. There are a number of factors that may affect the overall concentrations in fish tissue consumed by humans that may serve to decrease risks.
- Use of alternative treatments for non-detected chemicals in calculation of EPCs does not greatly affect sediment EPCs with the exception of dioxins, but does affect surface water EPCs. This is due largely to infrequency of detection in surface water.

Based on this information, changes to the risk assessment may result in less precautionary results that would eliminate specific pathways or COCs from consideration, but would not change the finding that chemicals in the Coke Point Offshore Area pose predicted risks to ecological and human health receptors higher than levels typically accepted by regulators and higher than predicted risks in Patapsco River background areas.

6.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. *Toxicological Profile for Polycyclic Aromatic Hydrocarbons.* U.S. Department of Health and Human Services, Public Health Service. August.

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. *Toxicological Profile for Polychlorinated Biphenyls.* U.S. Department of Health and Human Services, Public Health Service. November.

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. *Toxicological Profile for Arsenic*. U.S. Department of Health and Human Services, Public Health Service. August.

Devesa, V., M.L. Macho, et al. 2001. Arsenic in Cooked Seafood Products: Study on the Effect of Cooking on Total and Inorganic Arsenic Contents. *Journal of Agricultural and Food Chemistry* 49(8):4132-4140. July.

EA Engineering, Science, and Technology, Inc. (EA). 2009. *FY 08 Evaluation of Dredged Material: Baltimore Harbor Federal Navigation Channels, Patapsco River, Maryland*. Final. July.

Maryland Department of the Environment (MDE). 2010. *Recommended Maximum Meals Each Year for Maryland Waters.* http://www.mde.state.md.us/assets/document/Fish_Advisory_Table_2007.pdf#Recommended_Meals_Per_Year

Sherer, R.A., and P.S. Price. 1993. The effect of cooking processes on PCB levels in edible fish tissue. *Quality Assurance* 2(4):396-407. December.

U.S. Army Corps of Engineers (USACE). 2009. BSAF Database. USACE Engineer Research and Development Center. Accessed at http://el.erdc.usace.army.mil/bsafnew/.

U.S. Environmental Protection Agency (USEPA). 1997. *Exposure Factors Handbook: Volumes I, II, and III*. EPA/600/P-95/002a,b,c. August.

Zabik et al. 1996. Pesticide residues, PCBs and PAHs in baked, charbroiled, salt boiled and smoked Great Lakes lake trout. *Food Chemistry* 55(3):231-239. March.

FIGURES

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Figure 2.1. Map of arsenic in surface sediment determined by the method of ordinary kriging.

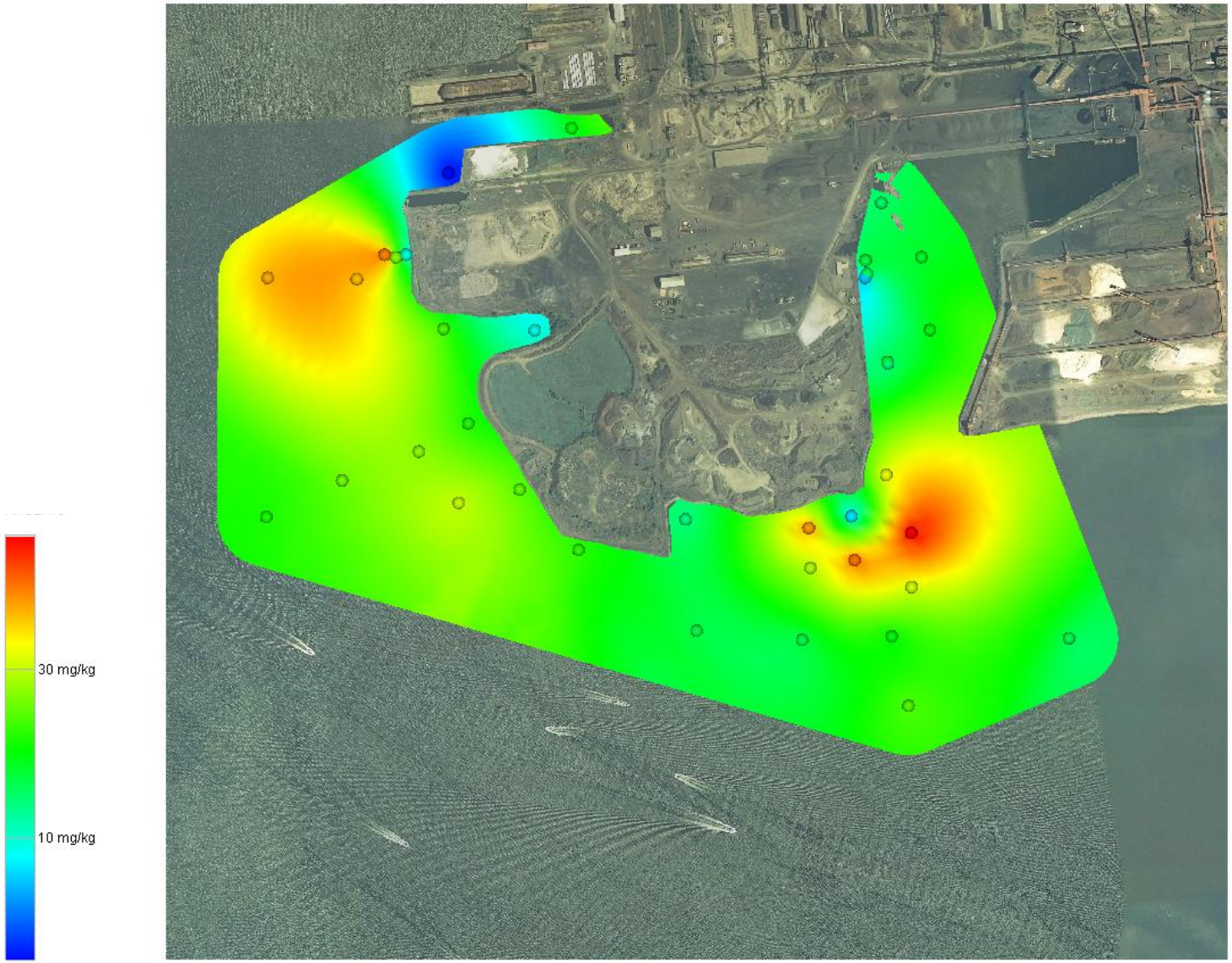


Figure 2.2. Map of cadmium in surface sediment determined by the method of ordinary kriging.

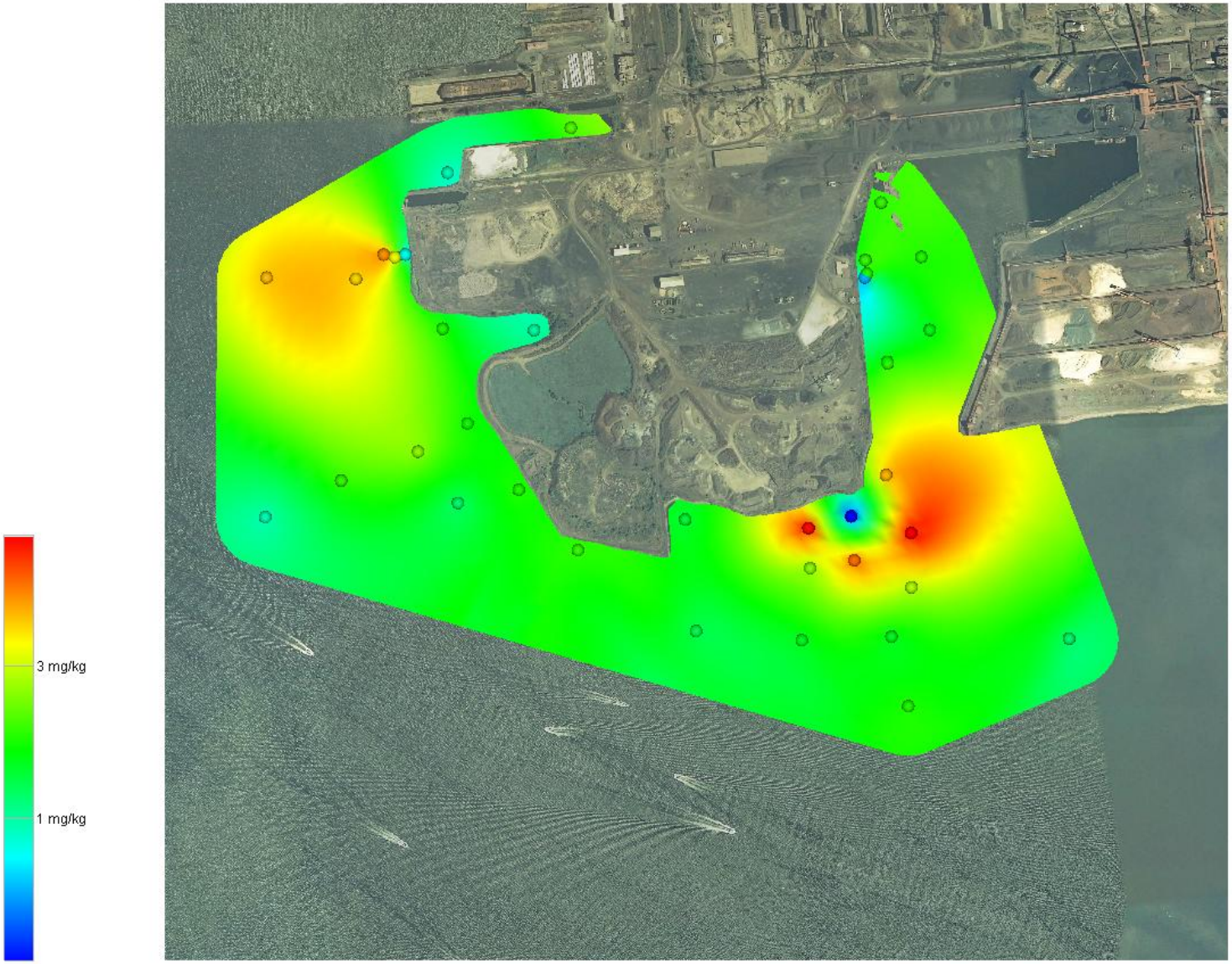


Figure 2.3. Map of chromium in surface sediment determined by the method of ordinary kriging.

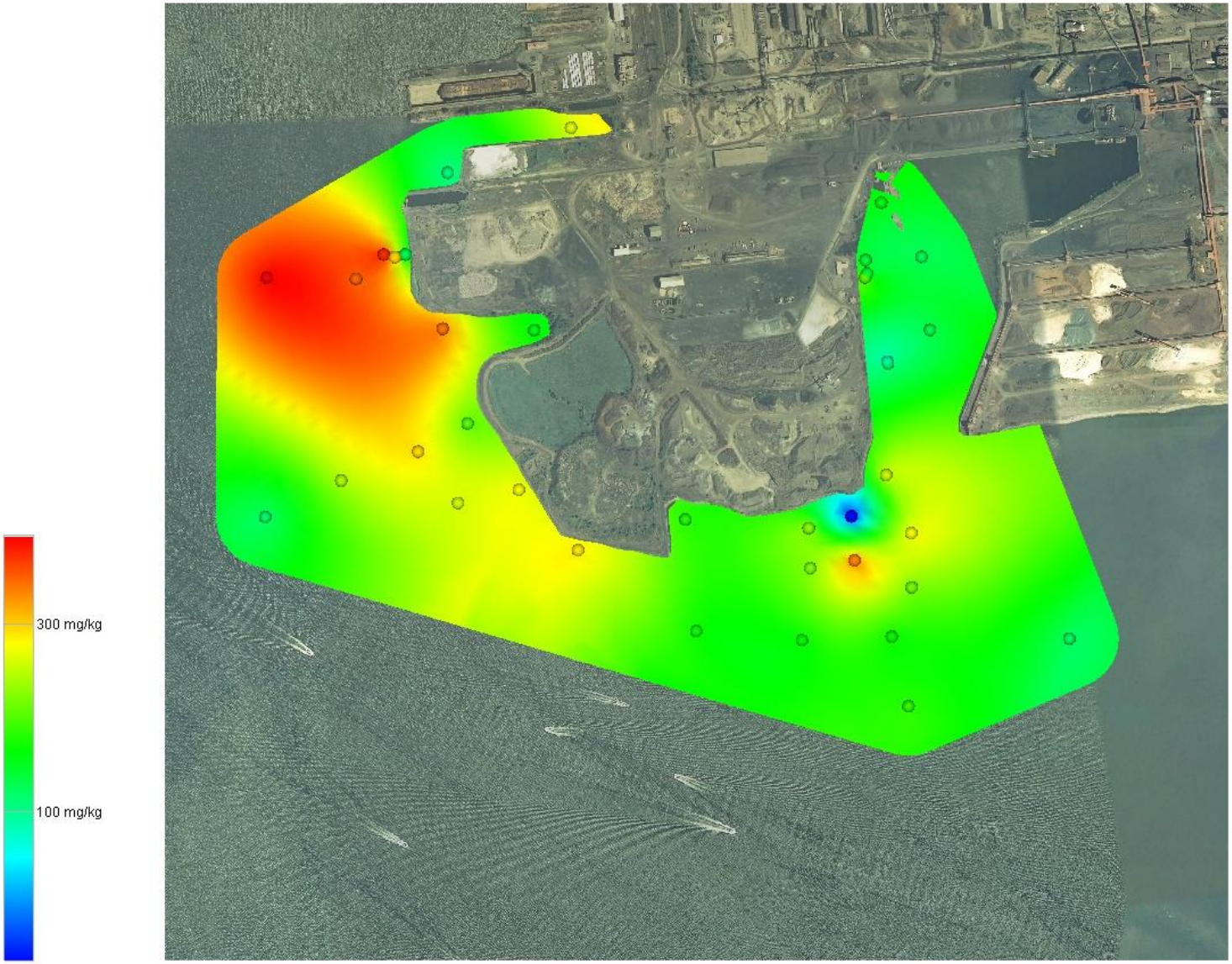


Figure 2.4. Map of copper in surface sediment determined by the method of ordinary kriging.

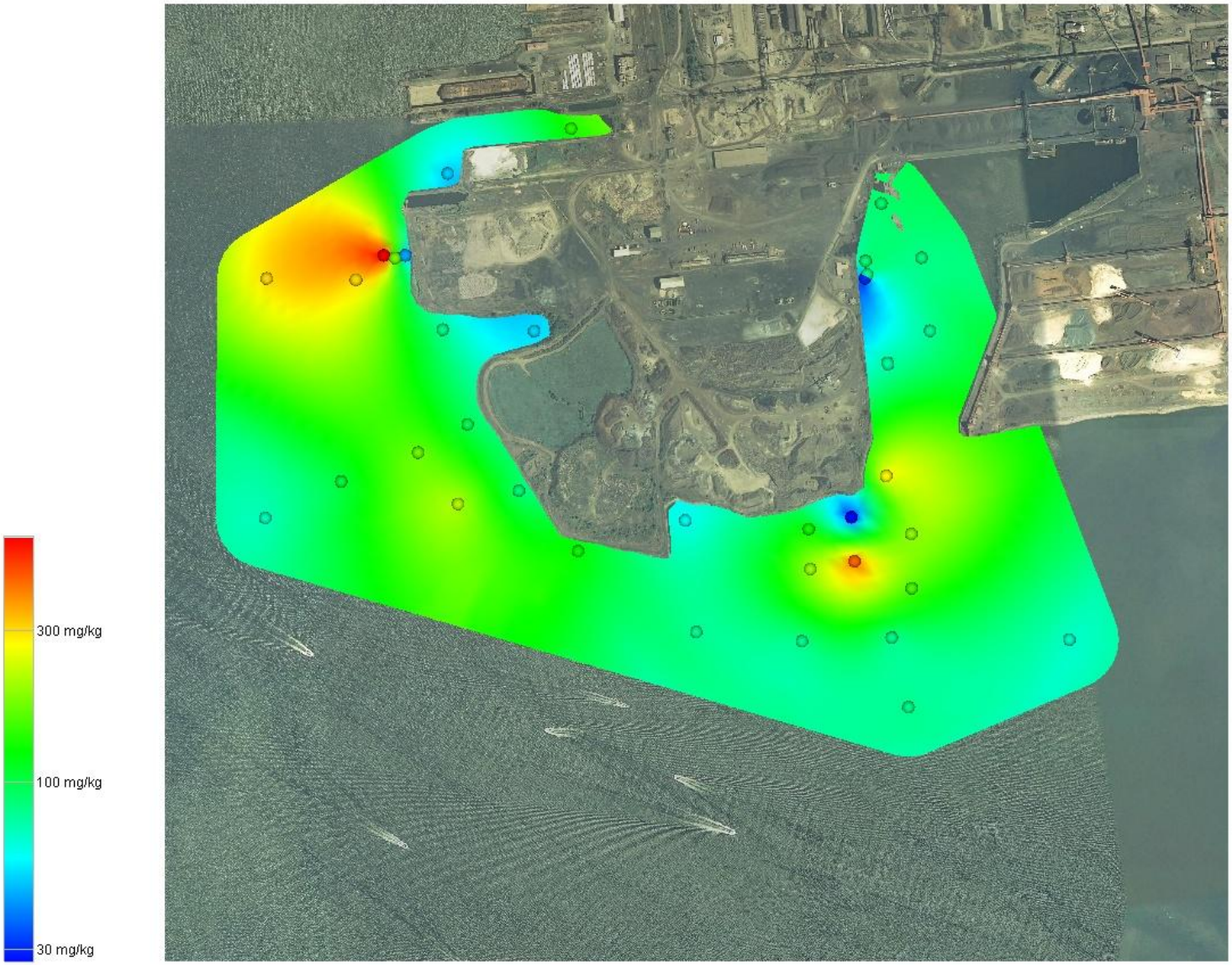


Figure 2.5. Map of lead in surface sediment determined by the method of ordinary kriging.

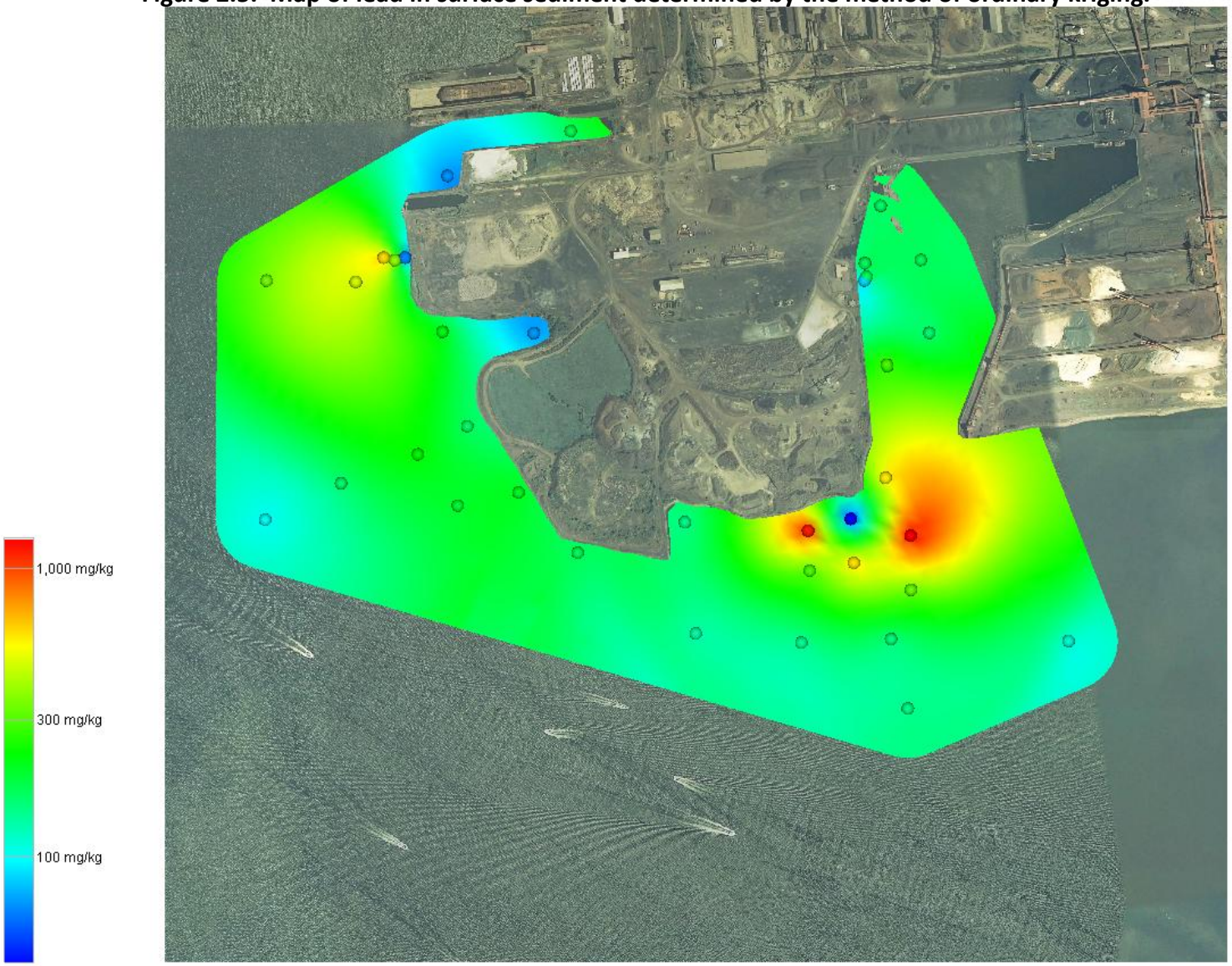


Figure 2.6. Map of total mercury in surface sediment determined by the method of ordinary kriging.

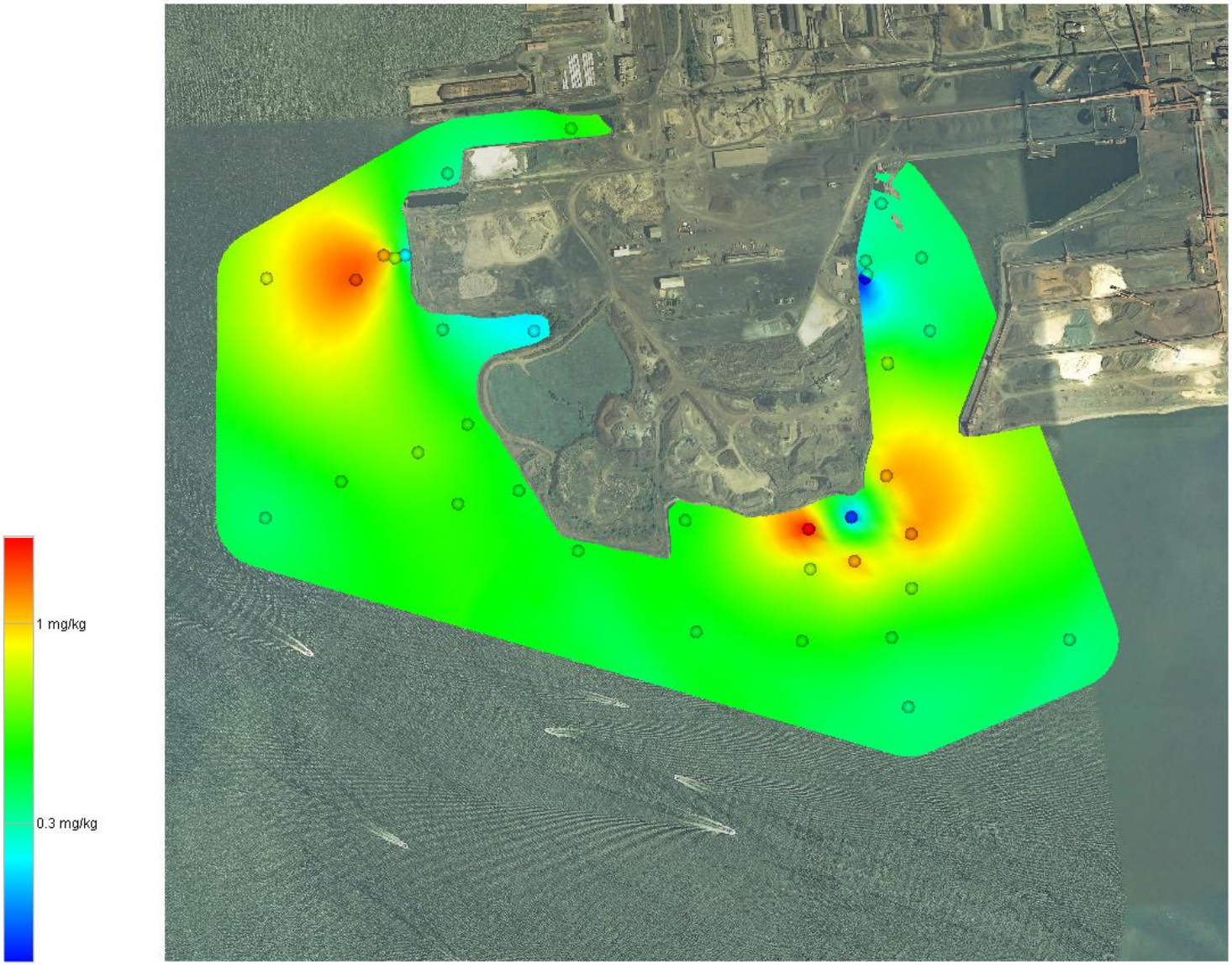


Figure 2.7. Map of zinc in surface sediment determined by the method of ordinary kriging.

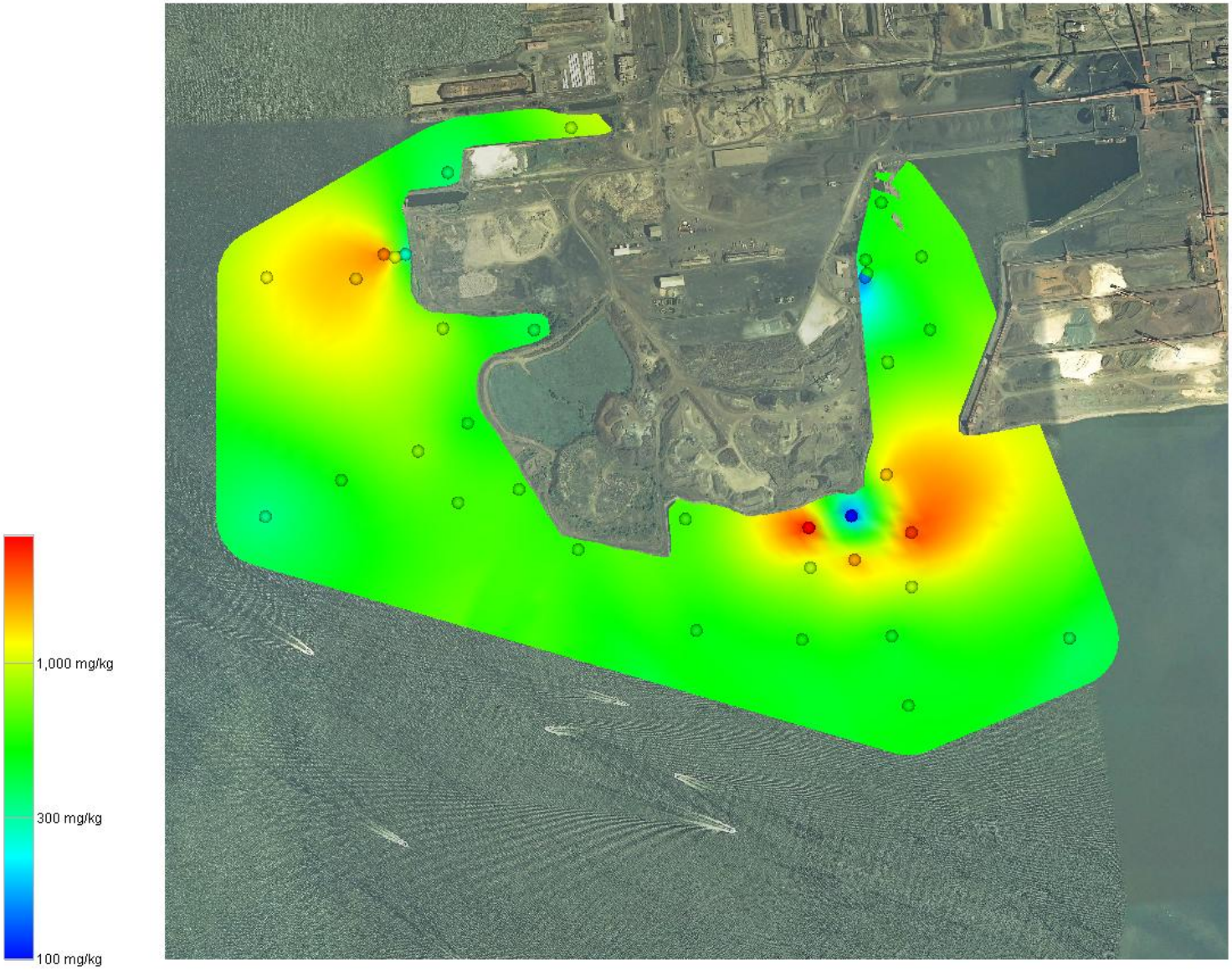


Figure 2.8. Map of benzo(a)anthracene in surface sediment determined by the method of ordinary kriging.

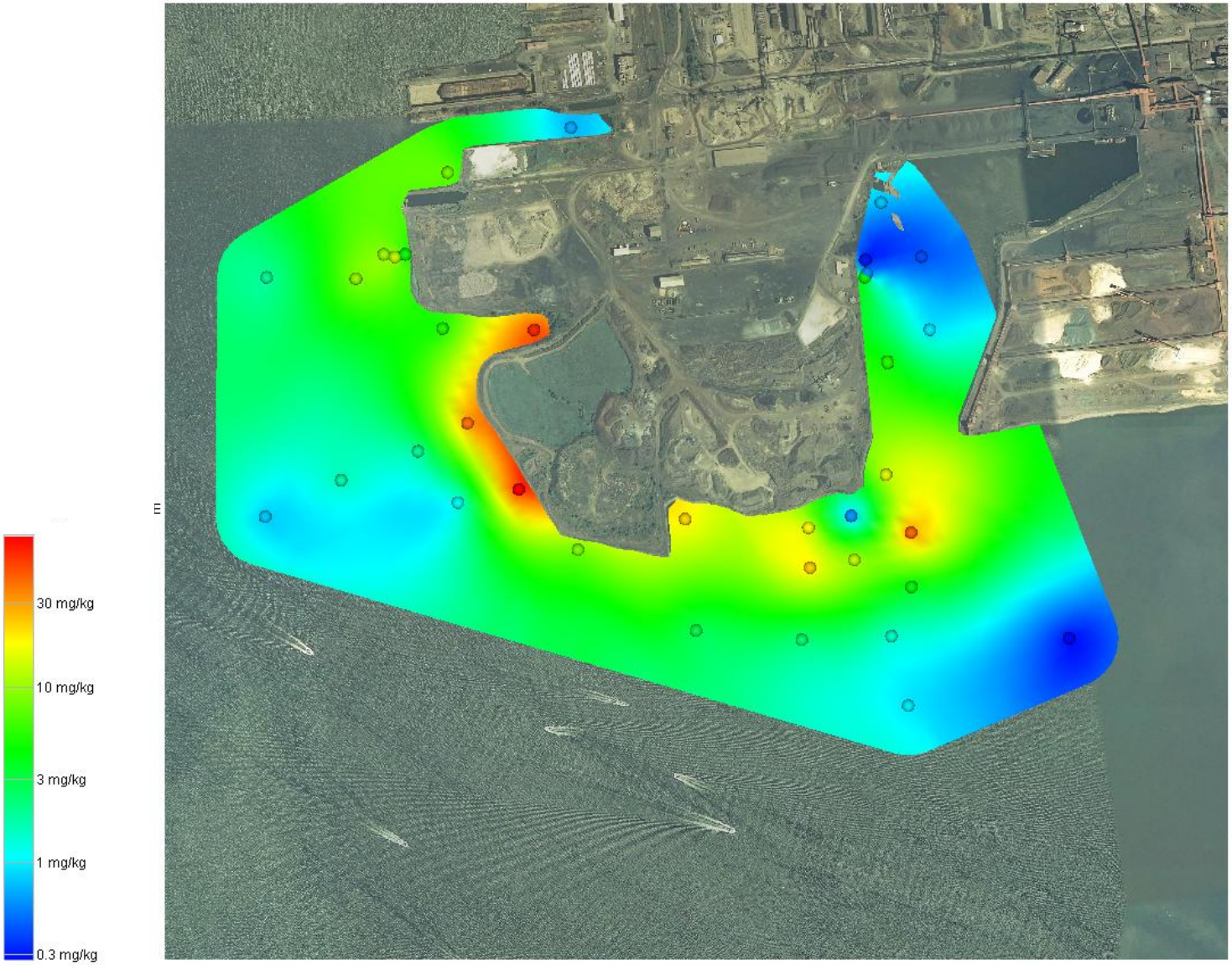


Figure 2.9. Map of benzo(b)fluoranthene in surface sediment determined by the method of ordinary kriging.

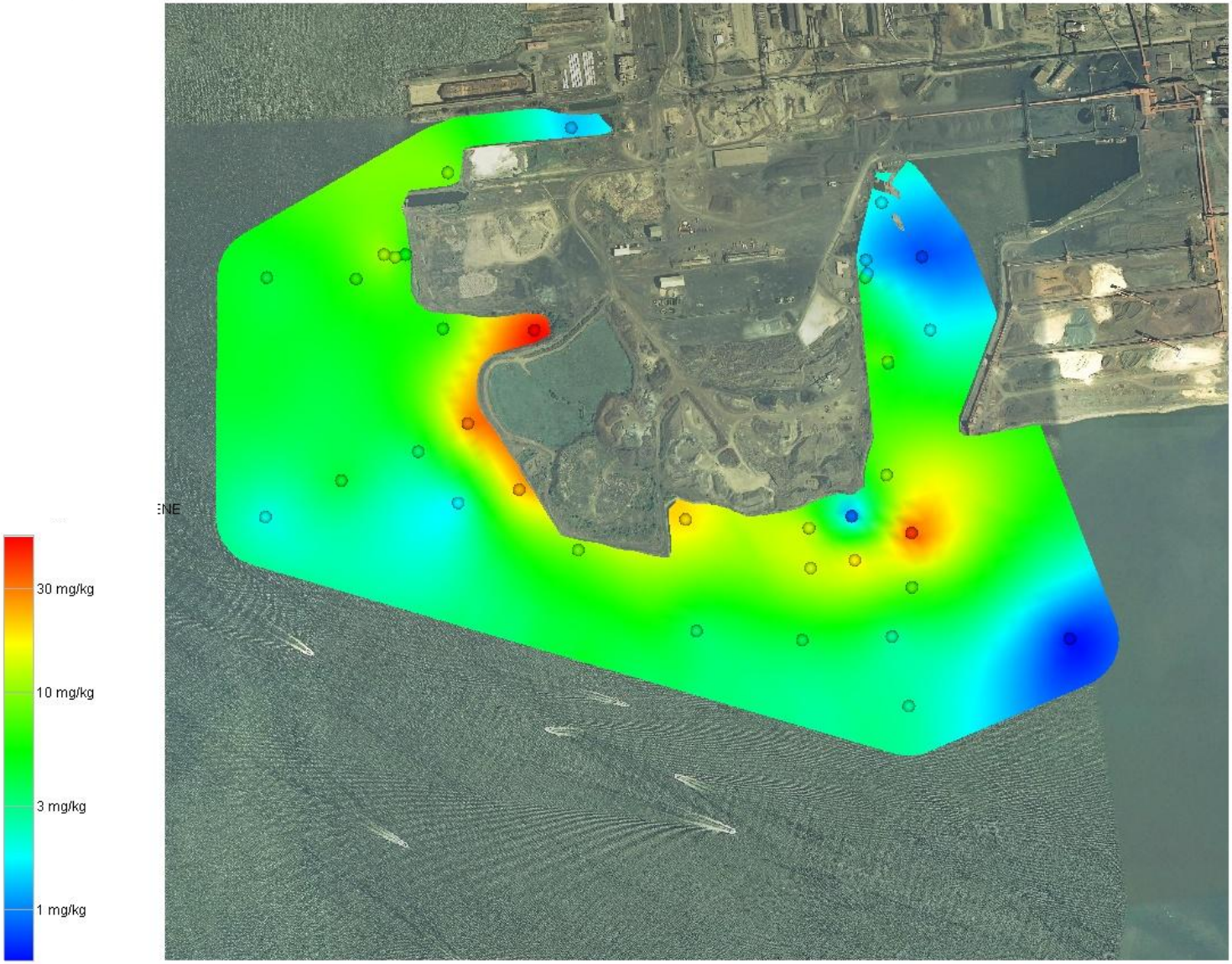


Figure 2.10. Map of benzo(a)pyrene in surface sediment determined by the method of ordinary kriging.

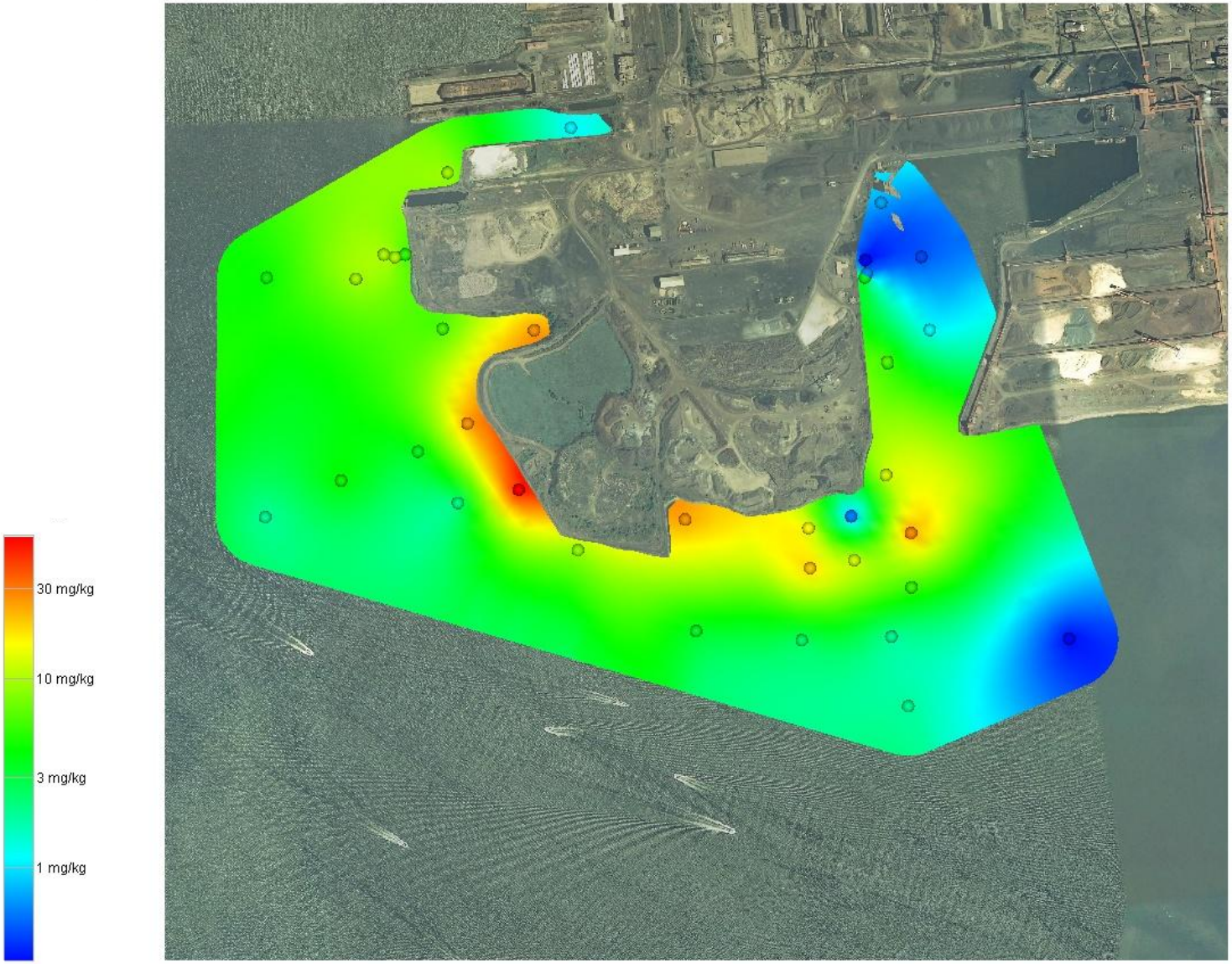


Figure 2.11. Map of dibenzo(a,h,)anthracene in surface sediment determined by the method of ordinary kriging.

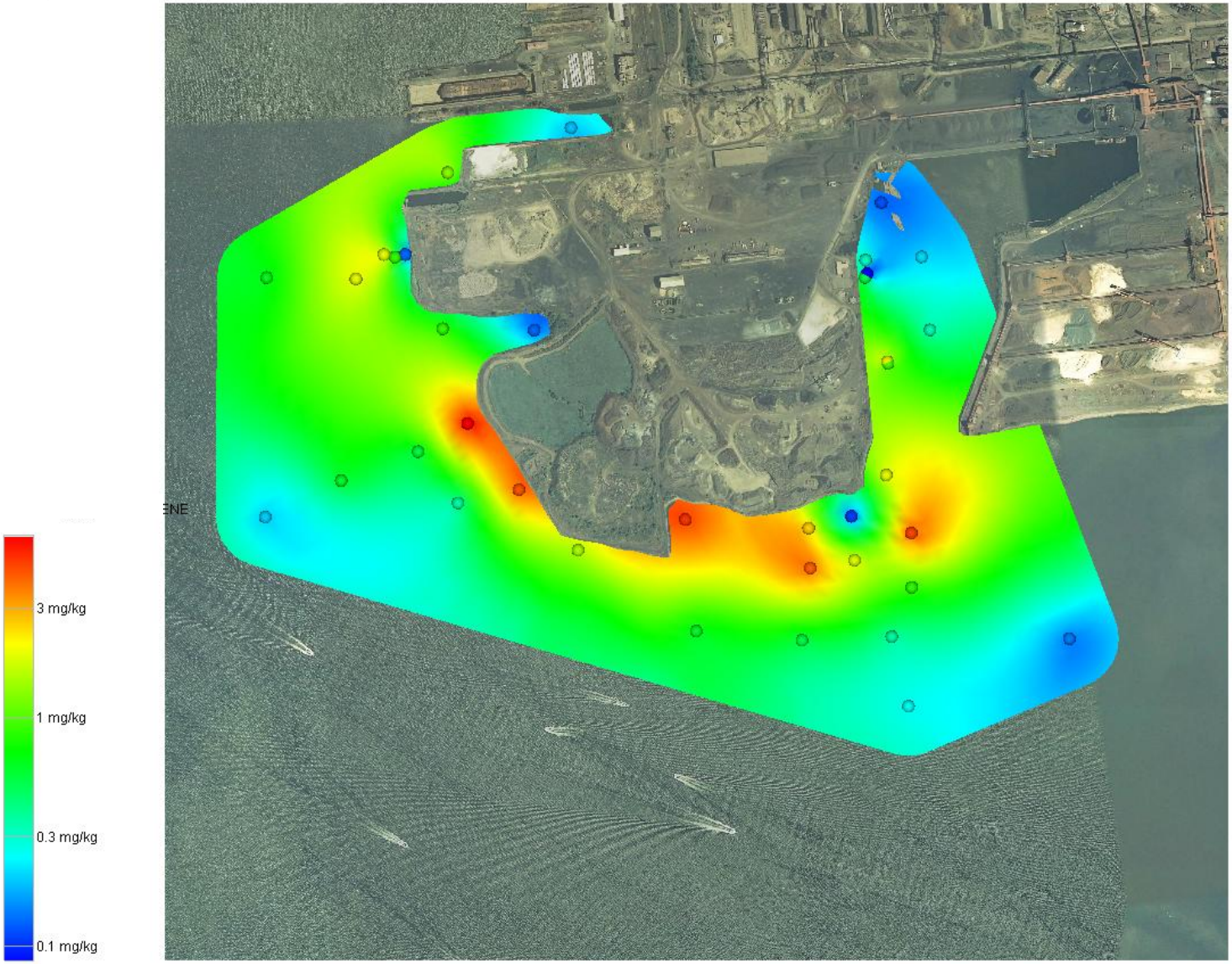


Figure 2.12. Map of indeno(1,2,3-cd)pyrene in surface sediment determined by the method of ordinary kriging.

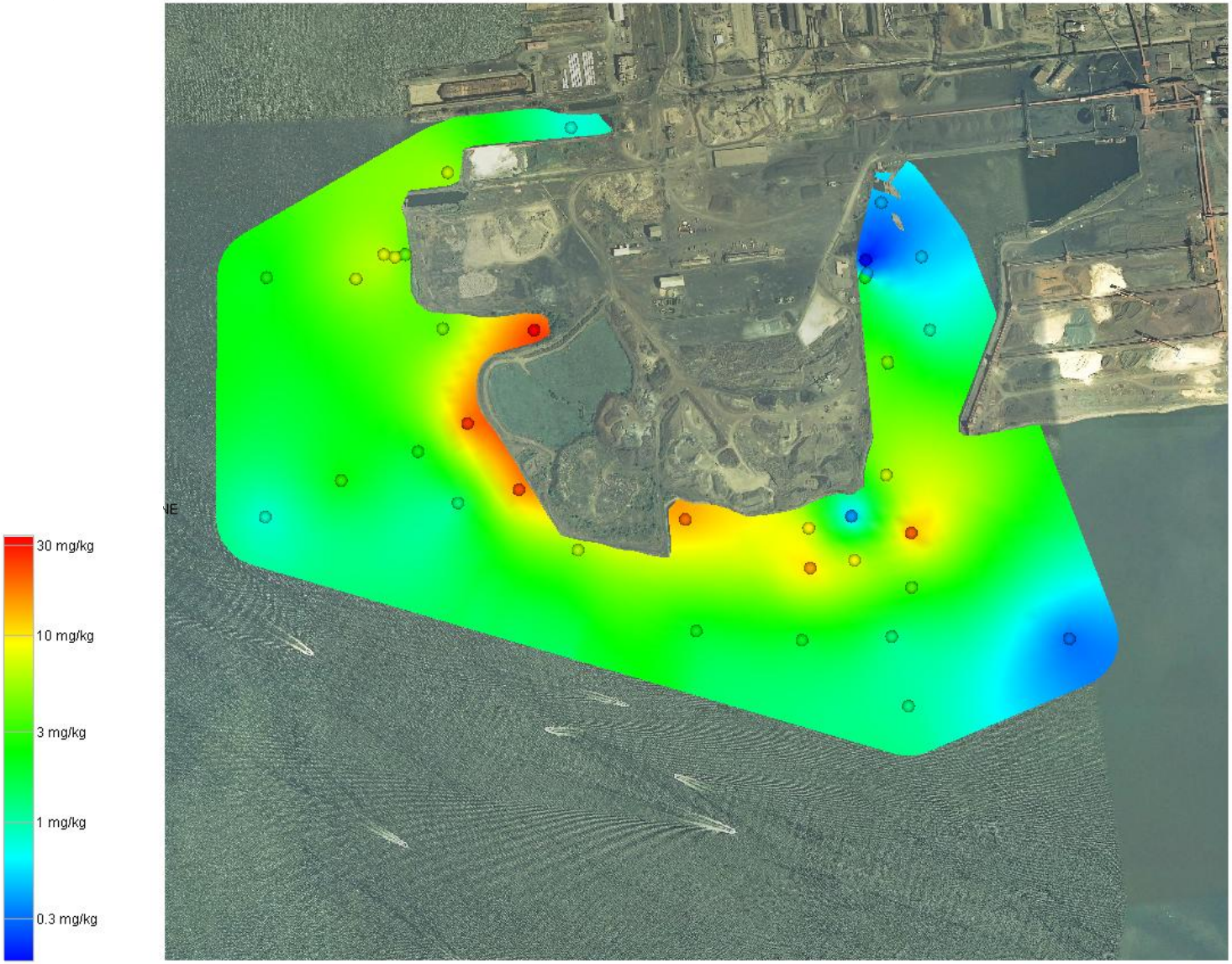


Figure 2.13. Map of low molecular weight PAHs in surface sediment determined by the method of ordinary kriging.

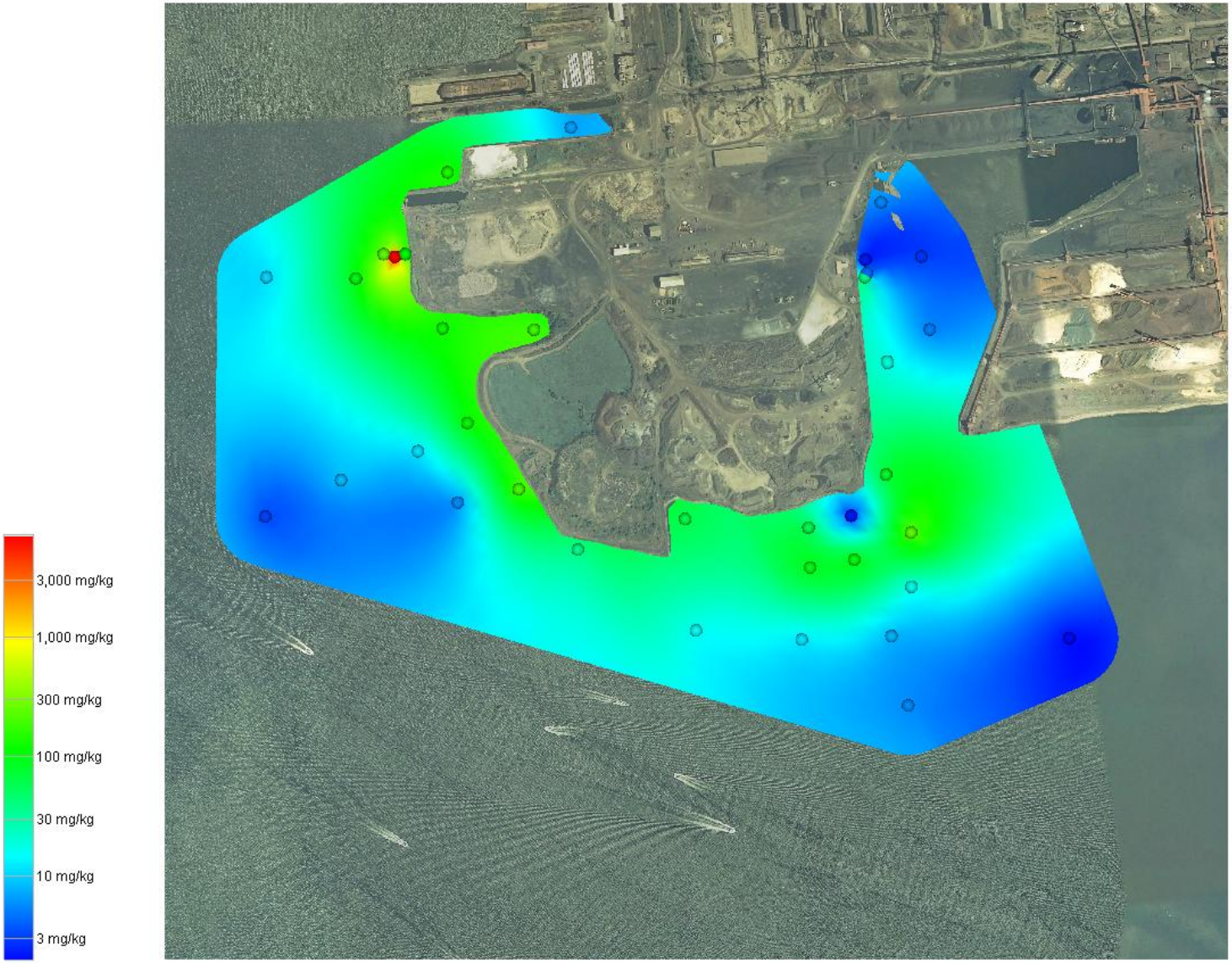


Figure 2.14. Map of high molecular weight PAHs in surface sediment determined by the method of ordinary kriging.

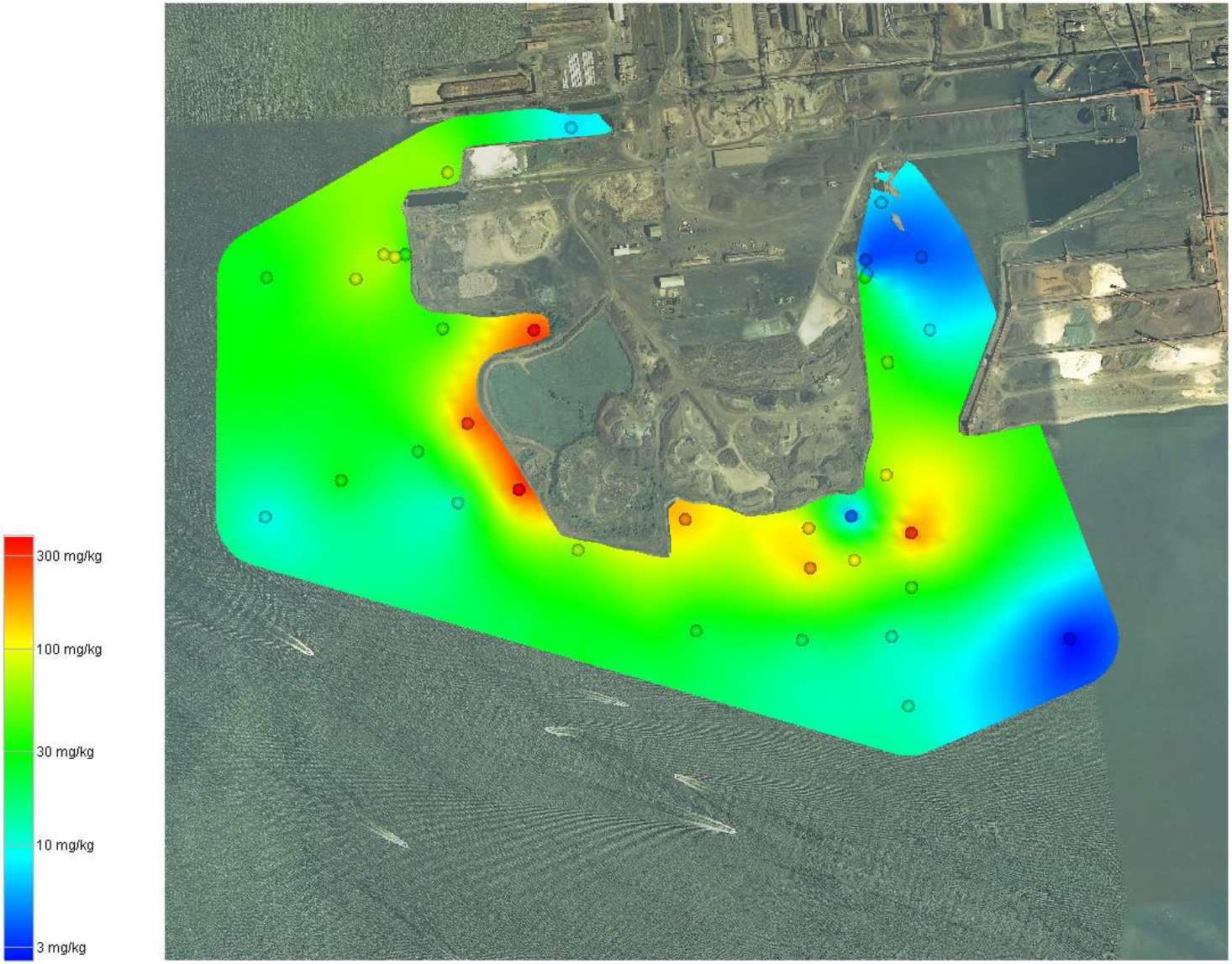
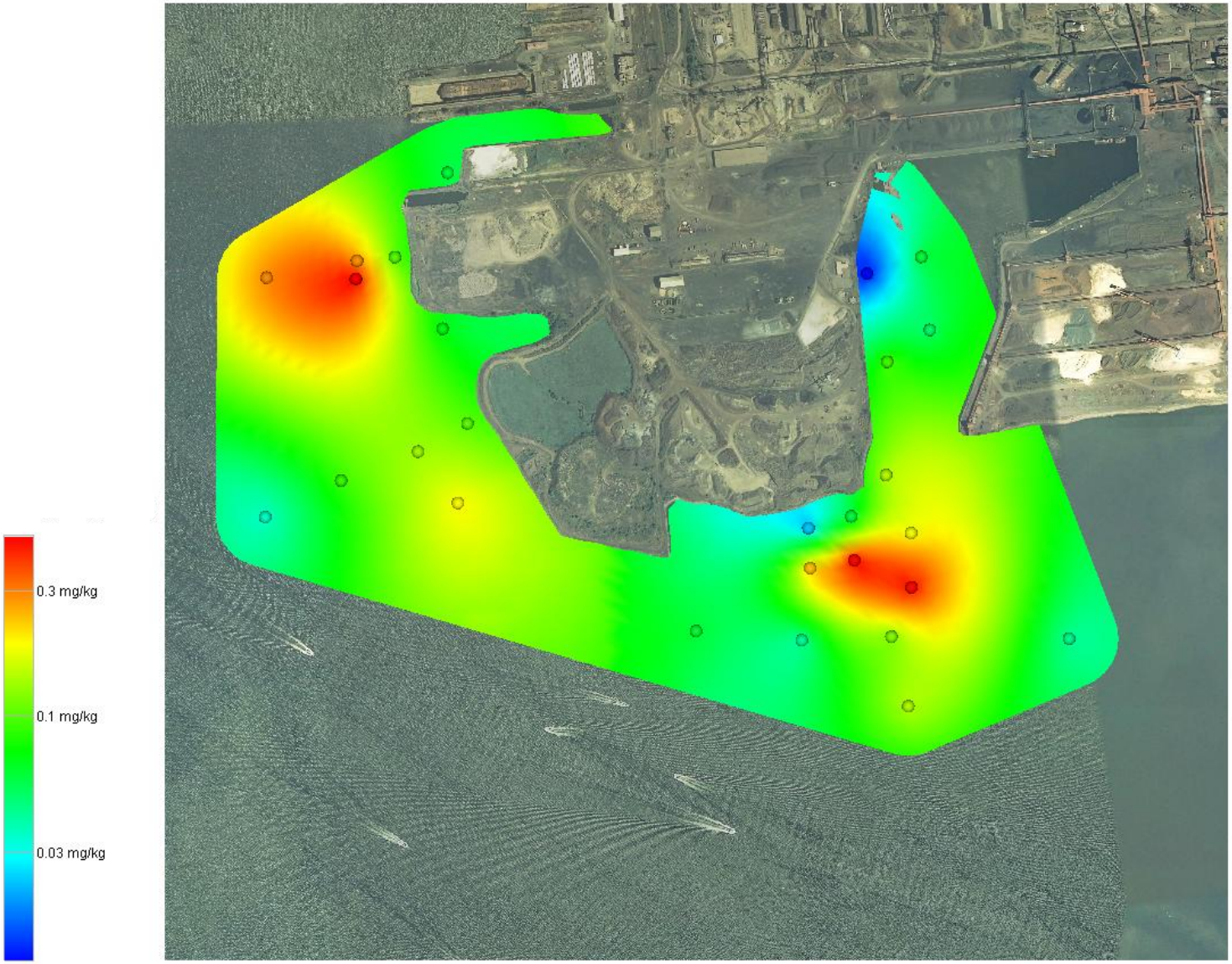


Figure 2.15. Map of PCBs in surface sediment determined by the method of ordinary kriging.



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TABLES

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TABLE 1.1
COMPARISON OF ALTERNATIVE BACKGROUND CONCENTRATIONS FOR SEDIMENT

Analyte Group	Frequency of Detection	Minimum Detected Concentration	Maximum Detected Concentration	95% UCLM	Median EPC	Method Detection Limits	Reporting Limits
METALS (mg/kg)							
ALUMINUM	3/3	4390	20400	NA	9830	0.19 - 0.47	2.0 - 4.9
ANTIMONY	3/3	0.21	1.7	NA	0.36	0.0017 - 0.0042	0.13 - 0.33
ARSENIC	6/6	2.2	16.2	10.71	3.75	0.012 - 0.33	0.066 - 1
BERYLLIUM	3/3	0.46	1.7	NA	1	0.005 - 0.012	0.066 - 0.16
CADMIUM	6/6	0.083	1.6	1.348	0.175	0.0046 - 0.07	0.066 - 0.5
CHROMIUM	6/6	22.8	225	204.3	31.65	0.0041 - 0.093	0.13 - 0.5
COBALT	3/3	7.8	19.8	NA	17.4	0.001 - 0.0024	0.033 - 0.082
COPPER	6/6	0.046	105	91.61	10.85	0.022 - 0.12	0.022 - 0.054
IRON	6/6	3300	43800	NA	8545	0.24 - 1.8	0.066 - 4
LEAD	6/6	0.018	121	NA	13.65	0.0025 - 0.16	0.33 - 1
MANGANESE	3/3	451	1260	NA	661	0.0068 - 0.017	0.066 - 0.16
MERCURY	5/6	0.014	0.39	0.227	0.048	0.0072 - 0.018	0.33 - 0.82
NICKEL	6/6	0.031	37.4	24.52	7.2	0.0075 - 0.12	0.066 - 0.16
SELENIUM	3/6	0.5	2.4	NA	0.96	0.033 - 0.26	0.33 - 2
SILVER	6/6	0.038	0.94	NA	0.125	0.0026 - 0.03	0.003 - 0.0032
THALLIUM	3/3	0.062	0.28	NA	0.11	0.0013 - 0.0033	0.011 - 0.012
TIN	3/3	2.8	38.5	NA	4.2	0.039 - 0.097	0.0036 - 0.0038
VANADIUM	3/3	21.4	94.4	NA	28.9	0.0052 - 0.013	0.02
ZINC	6/6	0.24	429	375.9	61.9	0.043 - 0.17	0.028 - 0.029
PAHS (ug/kg)							
1-METHYLNAPHTHALENE	3/6	2.1	330	NA	13.35	1.9 - 16	6.3 - 110
2-METHYLNAPHTHALENE	5/6	2.4	630	NA	10.85	2.2 - 21	6.3 - 110
ACENAPHTHENE	2/6	16	440	NA	11.35	2 - 17	6.3 - 110
ACENAPHTHYLENE	3/6	11	380	NA	8.85	2 - 21	6.3 - 110
ANTHRACENE	5/6	1.8	650	592	12.2	1.6 - 19	6.3 - 110
BENZO(A)ANTHRACENE	6/6	3.7	1200	3428	26	1.5 - 17	6.3 - 110
BENZO(A)PYRENE	6/6	3.7	1100	3039	22	2 - 30	6.3 - 110
BENZO(B)FLUORANTHENE	6/6	5.6	1900	5498	24.5	1.1 - 22	6.3 - 110
BENZO(GHI)PERYLENE	6/6	4.7	830	2131	18	1.2 - 7.9	6.3 - 110
BENZO(K)FLUORANTHENE	3/6	6.5	27	NA	15.85	2.2 - 22	6.3 - 110
CHRYSENE	6/6	3.8	1000	2753	17.35	1.3 - 19	6.3 - 110
DIBENZO(A,H)ANTHRACENE	4/6	2.6	260	149	21.85	1.3 - 24	6.3 - 110
FLUORANTHENE	6/6	3.9	2200	NA	34.2	2.1 - 9.1	6.3 - 110
FLUORENE	4/6	2.1	630	NA	8.35	2.1 - 16	6.3 - 110
INDENO(1,2,3-CD)PYRENE	6/6	3.7	870	NA	35	1.3 - 5.9	6.3 - 110
NAPHTHALENE	6/6	4.9	8300	15120	22.3	2.2 - 16	6.3 - 110
PHENANTHRENE	6/6	3.4	2000	6427	21.2	1.7 - 13	6.3 - 110
PYRENE	6/6	5.1	1400	6868	29	1.2 - 29	6.3 - 110

TABLE 1.2

COMPARISON OF ALTERNATIVE BACKGROUND CONCENTRATIONS FOR SURFACE WATER (ug/L)

Chemical	Patapsco River Background Area						Baltimore Harbor Channels Sampled in 2008 (Excluding Northwest Channels)		
	Frequency of Detection	Maximum Detected Concentration	95% UCLM	Method Detection Limits	Reporting Limits	Median Concentration	Frequency of Detection	95% UCLM	Maximum Detected Concentration
METALS									
ALUMINUM	9 / 9	106	85.89	2.6	30	33.6	11 / 11	80.43	132
ANTIMONY	9 / 9	0.3	0.253	0.019	2	0.19	11 / 11	0.567	0.84
ARSENIC	9 / 9	6.4	4.687	0.29	1	3.6	11 / 11	6.765	8.4
BERYLLIUM	1 / 9	0.038	NA	0.037	1	1	0 / 11	NA	NA
CHROMIUM	9 / 9	14.2	12.56	0.54	2	3.8	11 / 11	10.63	11.2
COBALT	9 / 9	0.68	0.483	0.026	0.5	0.36	11 / 11	0.748	0.88
COPPER	9 / 9	2.6	2.345	0.24	2	2.1	11 / 11	3.019	3.3
IRON	9 / 9	246	154.3	6.1	50	103	11 / 11	236	299
LEAD	8 / 9	0.46	0.352	0.019	1	0.077	11 / 11	0.643	0.83
MANGANESE	9 / 9	85.4	81.44	0.039	0.5	27.6	11 / 11	60.26	131
MERCURY	3 / 9	0.039	NA	0.038	0.2	0.2	4 / 11	0.0318	0.037
NICKEL	9 / 9	6.6	5.659	0.17	1	5	11 / 11	3.432	4
SELENIUM	9 / 9	17.1	12.57	0.42	5	9.3	11 / 11	21.6	26.1
THALLIUM	4 / 9	0.1	0.0911	0.015	1	1	NA	NA	NA
TIN	3 / 9	3.7	NA	1.5	5	5	2 / 11	NA	15.8
VANADIUM	8 / 9	2.1	1.524	0.082	1	1.2	NA	NA	NA
ZINC	9 / 9	9	6.635	0.96	5	5.1	11 / 11	24.25	41.6
PAHS									
1-METHYLNAPHTHALENE	2 / 9	0.067	NA	0.016 - 0.017	0.19	0.19	3 / 11	NA	0.051
2-METHYLNAPHTHALENE	4 / 9	0.15	0.123	0.015 - 0.016	0.19	0.19	4 / 11	0.0502	0.056
ACENAPHTHENE	1 / 9	0.017	NA	0.014	0.19	0.19	8 / 11	0.0563	0.095
ANTHRACENE	1 / 9	0.024	NA	0.0081 - 0.0086	0.19	0.19	6 / 11	0.0544	0.079
BENZO(A)ANTHRACENE	2 / 9	0.14	NA	0.017 - 0.018	0.19	0.19	3 / 11	NA	0.14
BENZO(A)PYRENE	2 / 9	0.051	NA	0.011 - 0.012	0.19	0.19	5 / 11	0.0615	0.068
BENZO(B)FLUORANTHENE	2 / 9	0.049	NA	0.015 - 0.016	0.19	0.19	4 / 11	0.134	0.16
BENZO(GHI)PERYLENE	1 / 9	0.074	NA	0.0081 - 0.0087	0.19	0.19	4 / 11	0.121	0.14
BENZO(K)FLUORANTHENE	2 / 9	0.069	NA	0.015 - 0.016	0.19	0.19	4 / 11	0.129	0.14
CHRYSENE	2 / 9	0.11	NA	0.01 - 0.011	0.19	0.19	3 / 11	NA	0.17
DIBENZO(A,H)ANTHRACENE	1 / 9	0.073	NA	0.012 - 0.013	0.19	0.19	5 / 11	0.149	0.21
FLUORANTHENE	4 / 9	0.56	0.488	0.0093 - 0.0099	0.19	0.19	7 / 11	0.0789	0.11
INDENO(1,2,3-CD)PYRENE	1 / 9	0.073	NA	0.015 - 0.016	0.19	0.19	5 / 11	0.107	0.15
NAPHTHALENE	5 / 9	0.36	0.174	0.026 - 0.028	0.19	0.19	1 / 11	NA	0.033
PHENANTHRENE	5 / 9	0.13	0.114	0.027 - 0.028	0.19	0.13	10 / 11	0.102	0.15
PYRENE	2 / 9	0.31	NA	0.01 - 0.011	0.19	0.19	8 / 11	0.0716	0.099

TABLE 1.3
HHRA CARCINOGENIC RISK SUMMARY USING VARIOUS DATA GROUPINGS
COKE POINT OFFSHORE AREA AND PATAPSCO RIVER BACKGROUND AREA

Receptor of Concern	Grouping/Data Handling	Exposure to Sediment	Exposure to Surface Water	Ingestion of Modeled Crabs	Ingestion of Modeled Fish	Cumulative Carcinogenic Risk
Adult Recreational User	Coke Point Offshore Area (95%UCLM with RL for non-detects)	$2.7x10^{-6}$	$9.2x10^{-4}$	$1.0x10^{-3}$	$6.0x10^{-4}$	**$2.5x10^{-3}$**
	Patapsco River Background Area (95%UCLM with RL for non-detects)	$3.0x10^{-7}$	$5.8x10^{-5}$	$1.3x10^{-4}$	$4.0x10^{-5}$	**$2.3x10^{-4}$**
	Patapsco River Background Area (Median with MDL for non-detects)	$3.3x10^{-8}$	$1.1x10^{-5}$	$1.6x10^{-5}$	$7.4x10^{-6}$	**$3.4x10^{-5}$**
Adolescent Recreational User	Coke Point Offshore Area (95%UCLM with RL for non-detects)	$1.2x10^{-5}$	$1.1x10^{-3}$	$9.7x10^{-4}$	$7.0x10^{-4}$	**$2.7x10^{-3}$**
	Patapsco River Background Area (95%UCLM with RL for non-detects)	$1.1x10^{-6}$	$6.7x10^{-5}$	$9.7x10^{-5}$	$4.5x10^{-5}$	**$2.1x10^{-4}$**
	Patapsco River Background Area (Median with MDL for non-detects)	$6.6x10^{-8}$	$1.2x10^{-5}$	$8.1x10^{-6}$	$8.4x10^{-6}$	**$2.9x10^{-5}$**
Child Recreational User	Coke Point Offshore Area (95%UCLM with RL for non-detects)	$6.4x10^{-6}$	$3.9x10^{-4}$	$3.6x10^{-4}$	$2.6x10^{-4}$	**$1.0x10^{-3}$**
	Patapsco River Background Area (95%UCLM with RL for non-detects)	$5.7x10^{-7}$	$2.5x10^{-5}$	$3.6x10^{-5}$	$1.7x10^{-5}$	**$7.9x10^{-5}$**
	Patapsco River Background Area (Median with MDL for non-detects)	$3.4x10^{-8}$	$4.5x10^{-6}$	$3.0x10^{-6}$	$3.2x10^{-6}$	**$1.1x10^{-5}$**
Watermen	Coke Point Offshore Area (95%UCLM with RL for non-detects)	$9.6x10^{-6}$	$4.9x10^{-4}$	$1.3x10^{-3}$	$7.4x10^{-4}$	**$2.5x10^{-3}$**
	Patapsco River Background Area (95%UCLM with RL for non-detects)	$1.1x10^{-6}$	$1.5x10^{-5}$	$1.6x10^{-4}$	$4.8x10^{-5}$	**$2.2x10^{-4}$**
	Patapsco River Background Area (Median with MDL for non-detects)	$1.1x10^{-7}$	$2.9x10^{-6}$	$2.0x10^{-5}$	$9.0x10^{-6}$	**$3.2x10^{-5}$**

TABLE 1.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SEDIMENT

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	Median Concentration	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DIOXINS									
WHO TEQ (ND=DL)	mg/kg	4.42E-06	2.59E-06	1.15E-05		mg/kg	2.59E-06	Median	CRAB COPC
METALS									
ARSENIC	mg/kg	6.22E+00	3.75E+00	1.62E+01		mg/kg	3.75E+00	Median	CRAB COPC
COBALT	mg/kg	1.50E+01	1.74E+01	1.98E+01		mg/kg	1.74E+01	Median	CRAB COPC
VANADIUM	mg/kg	4.82E+01	2.89E+01	9.44E+01		mg/kg	2.89E+01	Median	CRAB COPC
PAHS									
BENZO(A)PYRENE	mg/kg	2.03E-01	2.20E-02	1.10E+00		mg/kg	2.20E-02	Median	SD COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	6.06E-02	2.19E-02	2.60E-01		mg/kg	2.19E-02	Median	CRAB COPC
PCB CONGENERS									
TOTAL PCBs (ND=DL)	mg/kg	1.70E-02	8.16E-03	5.83E-02		mg/kg	8.16E-03	Median	SD COPC

Note: Statistics calculated by the USEPA program ProUCL (USEPA 2009).
NA = Not Applicable
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detectionl Limit
mg/kg = milligrams per kilogram
Data Qualifiers:
L = Reported value may be biased low.

TABLE 1.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - SURFACE WATER

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	Median Concentration	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
METALS									
ARSENIC	µg/L	3.96E+00	3.60E+00	6.40E+00		µg/L	3.60E+00	Median	FISH COPC
MERCURY	µg/L	3.83E-02	3.80E-02	3.90E-02	B	µg/L	3.80E-02	Median	FISH COPC
SELENIUM	µg/L	1.03E+01	9.30E+00	1.71E+01		µg/L	9.30E+00	Median	FISH COPC
PAHS									
BENZO(A)ANTHRACENE	µg/L	3.28E-02	1.70E-02	1.40E-01	J	µg/L	1.70E-02	Median	SW COPC
BENZO(A)PYRENE	µg/L	1.93E-02	1.10E-02	5.10E-02	J	µg/L	1.10E-02	Median	SW COPC
BENZO(B)FLUORANTHENE	µg/L	2.20E-02	1.50E-02	4.90E-02	J	µg/L	1.50E-02	Median	FISH COPC
DIBENZO(A,H)ANTHRACENE	µg/L	1.89E-02	1.20E-02	7.30E-02	J	µg/L	1.20E-02	Median	SW COPC
INDENO(1,2,3-CD)PYRENE	µg/L	2.17E-02	1.50E-02	7.30E-02	J	µg/L	1.50E-02	Median	SW COPC

EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detectionl Limit
µg/L = micrograms per liter
Data Qualifiers:
B = Value is estimated.
J = Value is estimated.

TABLE 1.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - CRABS

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Crabs
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
DIOXINS								
WHO TEQ (ND=DL)	mg/kg	NA	NA	NA		mg/kg	6.08E-07	CRAB COPC
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	2.03E-01	CRAB COPC
COBALT	mg/kg	NA	NA	NA		mg/kg	1.68E-01	CRAB COPC
VANADIUM	mg/kg	NA	NA	NA		mg/kg	1.56E+00	CRAB COPC
PAHS								
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	1.61E-03	CRAB COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	3.88E-03	CRAB COPC
PCB CONGENERS								
TOTAL PCBs (ND=DL)	mg/kg	NA	NA	NA		mg/kg	5.64E-02	CRAB COPC

Modeled crab concentrations reflect wet weight concentrations.
Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to sediment.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
PCB = Polychlorinated Bipheyl
ND = Not Detected
DL = Detectionl Limit
mg/kg = milligrams per kilogram

TABLE 1.7
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND - FINFISH

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Finfish
Exposure Point: Patapsco River Background

Chemical of Potential Concern	Units	Mean Concentration	95% UCLM	Maximum Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure	
							Medium EPC Value	Medium EPC Rationale
METALS								
ARSENIC	mg/kg	NA	NA	NA		mg/kg	1.44E-02	FISH COPC
MERCURY	mg/kg	NA	NA	NA		mg/kg	6.84E-02	FISH COPC
SELENIUM	mg/kg	NA	NA	NA		mg/kg	2.25E+00	FISH COPC
PAHS								
BENZO(A)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	9.91E-03	FISH COPC
BENZO(A)PYRENE	mg/kg	NA	NA	NA		mg/kg	6.41E-03	FISH COPC
BENZO(B)FLUORANTHENE	mg/kg	NA	NA	NA		mg/kg	8.75E-03	FISH COPC
DIBENZO(A,H)ANTHRACENE	mg/kg	NA	NA	NA		mg/kg	7.00E-03	FISH COPC
INDENO(1,2,3-CD)PYRENE	mg/kg	NA	NA	NA		mg/kg	8.75E-03	FISH COPC

Bioaccumulation factors (BAFs) are used to determine the concentrations of chemicals in aquatic organisms exposed to surface water.
NA = Not Applicable
95%UCLM = 95 percent upper confidence limit on the mean
EPC = exposure point concentration
PAHS = Polycyclic Aromatic Hydrocarbons
ND = Not Detected
DL = Detectionl Limit
mg/kg = milligrams per kilogram

TABLE 1.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-06	(mg/kg)	1.13E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.69E-09	2.63E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	2.63E-05
				METALS												
				ARSENIC	3.75E+00	(mg/kg)	1.64E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.45E-08	3.82E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.27E-04
				COBALT	1.74E+01	(mg/kg)	2.53E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.90E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.97E-04
				VANADIUM	2.89E+01	(mg/kg)	4.20E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	9.81E-08	(mg/kg-day)	1.30E-04	(mg/kg-day)	7.54E-04
				PAHS												
				BENZO(A)PYRENE	2.20E-02	(mg/kg)	4.16E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.04E-09	9.70E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.19E-02	(mg/kg)	4.13E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.02E-09	9.64E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	8.16E-03	(mg/kg)	1.66E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	3.32E-10	3.88E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.26E-08**					**1.10E-03**
		Exposure Point Total									**3.26E-08**					**1.10E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	3.75E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	4.88E-06	8.76E-11	(mg/kg-day)	1.00E-09	(mg/kg-day)	8.76E-02
				METALS												
				ARSENIC	2.03E-02	(mg/kg)	1.25E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.88E-06	2.92E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.74E-03
				COBALT	1.68E-01	(mg/kg)	1.04E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.42E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.07E-02
				VANADIUM	1.56E+00	(mg/kg)	9.63E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.25E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.49E-02
				PAHS												
				BENZO(A)PYRENE	1.61E-03	(mg/kg)	9.93E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.25E-07	2.32E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	3.88E-03	(mg/kg)	2.40E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.75E-06	5.59E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.64E-02	(mg/kg)	3.48E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	6.96E-06	8.12E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.62E-05**					**2.23E-01**
		Exposure Point Total									**1.62E-05**					**2.23E-01**
	Exposure Medium Total										**1.62E-05**					**2.24E-01**
Sediment Total											**1.62E-05**					**2.24E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	3.86E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.80E-08	9.02E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.01E-04
				MERCURY	3.80E-05	(mg/L)	4.08E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	9.52E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.52E-06
				SELENIUM	9.30E-03	(mg/L)	9.98E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.33E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.66E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	1.82E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.33E-10	4.26E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	1.61E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.18E-10	3.76E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	1.18E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.62E-10	2.76E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	1.29E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.40E-10	3.01E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	1.61E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.18E-10	3.76E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**6.01E-08**					**3.57E-04**
			Dermal	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	6.96E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.04E-07	1.62E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.41E-04
				MERCURY	3.80E-05	(mg/L)	7.34E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.71E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.71E-05
				SELENIUM	9.30E-03	(mg/L)	1.62E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.79E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	7.57E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	4.26E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.11E-07	9.95E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	6.54E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.78E-07	1.53E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	4.73E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.45E-06	1.10E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	7.96E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.81E-06	1.86E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	6.54E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.78E-07	1.53E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.06E-05**					**6.34E-04**
		Exposure Point Total									**1.07E-05**					**9.91E-04**

TABLE 1.8
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.44E-03	(mg/kg)	8.89E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.33E-07	2.07E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.91E-04
				MERCURY	6.84E-02	(mg/kg)	4.22E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	9.85E-06	(mg/kg-day)	1.00E-04	(mg/kg-day)	9.85E-02
				SELENIUM	2.25E+00	(mg/kg)	1.39E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.24E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.48E-02
				PAHS												
				BENZO(A)ANTHRACENE	9.91E-03	(mg/kg)	6.12E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.47E-07	1.43E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	8.75E-03	(mg/kg)	5.40E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.94E-07	1.26E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	6.41E-03	(mg/kg)	3.96E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.89E-06	9.24E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.00E-03	(mg/kg)	4.32E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.15E-06	1.01E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.75E-03	(mg/kg)	5.40E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.94E-07	1.26E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**7.41E-06**					**1.64E-01**
		Exposure Point Total									**7.41E-06**					**1.64E-01**
	Exposure Medium Total										**1.81E-05**					**1.65E-01**
Surface Water Total											**1.81E-05**					**1.65E-01**
										Total of Receptor Risks Across All Media	**3.43E-05**				Total of Receptor Hazards Across All Media	**3.89E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 1.9
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-06	(mg/kg)	1.67E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	2.51E-09	1.17E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.17E-04
				METALS												
				ARSENIC	3.75E+00	(mg/kg)	2.42E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	3.64E-08	1.70E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.65E-04
				COBALT	1.74E+01	(mg/kg)	3.75E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.62E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.75E-04
				VANADIUM	2.89E+01	(mg/kg)	6.23E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.36E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	3.35E-03
				PAHS												
				BENZO(A)PYRENE	2.20E-02	(mg/kg)	1.85E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.35E-08	4.31E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.19E-02	(mg/kg)	1.84E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.34E-08	4.28E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	8.16E-03	(mg/kg)	2.46E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	4.92E-10	1.72E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**6.62E-08**					**4.91E-03**
		Exposure Point Total									**6.62E-08**					**4.91E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	1.44E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	1.87E-06	1.01E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.01E-01
				METALS												
				ARSENIC	2.03E-02	(mg/kg)	4.80E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.20E-07	3.36E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.12E-02
				COBALT	1.68E-01	(mg/kg)	3.98E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.79E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.28E-02
				VANADIUM	1.56E+00	(mg/kg)	3.69E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.58E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.17E-02
				PAHS												
				BENZO(A)PYRENE	1.61E-03	(mg/kg)	1.14E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.33E-07	2.66E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	3.88E-03	(mg/kg)	2.76E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.01E-06	6.43E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.64E-02	(mg/kg)	1.33E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.67E-06	9.33E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.10E-06**					**2.56E-01**
		Exposure Point Total									**8.10E-06**					**2.56E-01**
	Exposure Medium Total										**8.17E-06**					**2.61E-01**
Sediment Total											**8.17E-06**					**2.61E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	1.00E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.50E-08	7.01E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.34E-04
				MERCURY	3.80E-05	(mg/L)	1.06E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	7.40E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.40E-06
				SELENIUM	9.30E-03	(mg/L)	2.59E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.62E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	1.42E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.04E-10	3.31E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	1.25E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.14E-11	2.92E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	9.18E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.70E-10	2.14E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	1.00E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.31E-10	2.34E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	1.25E-10	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.14E-11	2.92E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.67E-08**					**2.77E-04**
			Dermal	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	2.68E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.01E-08	1.87E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.24E-04
				MERCURY	3.80E-05	(mg/L)	2.82E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.98E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.98E-05
				SELENIUM	9.30E-03	(mg/L)	6.24E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.37E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.74E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	4.92E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.59E-07	1.15E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	7.55E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.51E-07	1.76E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	5.45E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.98E-06	1.27E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	9.18E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.70E-06	2.14E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	7.55E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.51E-07	1.76E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.22E-05**					**7.31E-04**
		Exposure Point Total									**1.22E-05**					**1.01E-03**

TABLE 1.9
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.44E-03	(mg/kg)	3.41E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	5.11E-08	2.38E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.95E-04
				MERCURY	6.84E-02	(mg/kg)	1.62E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.13E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.13E-01
				SELENIUM	2.25E+00	(mg/kg)	5.32E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.73E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	7.45E-02
				PAHS												
				BENZO(A)ANTHRACENE	9.91E-03	(mg/kg)	7.03E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.13E-07	1.64E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	8.75E-03	(mg/kg)	6.21E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.53E-07	1.45E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	6.41E-03	(mg/kg)	4.55E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.32E-06	1.06E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.00E-03	(mg/kg)	4.97E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.62E-06	1.16E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.75E-03	(mg/kg)	6.21E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.53E-07	1.45E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**8.42E-06**					**1.89E-01**
		Exposure Point Total									**8.42E-06**					**1.89E-01**
	Exposure Medium Total										**2.06E-05**					**1.90E-01**
Surface Water Total											**2.06E-05**					**1.90E-01**
										Total of Receptor Risks Across All Media	**2.88E-05**				Total of Receptor Hazards Across All Media	**4.51E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 1.10
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-06	(mg/kg)	8.49E-15	(mg/kg-day)	1.50E+05	per (mg/kg-day)	1.27E-09	1.98E-13	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.98E-04
				METALS												
				ARSENIC	3.75E+00	(mg/kg)	1.23E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.85E-08	2.87E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.57E-04
				COBALT	1.74E+01	(mg/kg)	1.90E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	4.44E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.48E-03
				VANADIUM	2.89E+01	(mg/kg)	3.16E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	7.38E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	5.67E-03
				PAHS												
				BENZO(A)PYRENE	2.20E-02	(mg/kg)	9.38E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.85E-09	7.30E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.19E-02	(mg/kg)	9.32E-10	(mg/kg-day)	7.30E+00	per (mg/kg-day)	6.80E-09	7.25E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	8.16E-03	(mg/kg)	1.25E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	2.50E-10	2.92E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.36E-08**					**8.31E-03**
		Exposure Point Total									**3.36E-08**					**8.31E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	5.39E-12	(mg/kg-day)	1.30E+05	per (mg/kg-day)	7.01E-07	1.26E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.26E-01
				METALS												
				ARSENIC	2.03E-02	(mg/kg)	1.80E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.70E-07	4.20E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.40E-02
				COBALT	1.68E-01	(mg/kg)	1.49E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.48E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.16E-01
				VANADIUM	1.56E+00	(mg/kg)	1.38E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	3.23E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.46E-02
				PAHS												
				BENZO(A)PYRENE	1.61E-03	(mg/kg)	4.28E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.12E-07	3.33E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	3.88E-03	(mg/kg)	1.03E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.55E-07	8.04E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.64E-02	(mg/kg)	5.00E-07	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.00E-06	1.17E-05	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.04E-06**					**3.20E-01**
		Exposure Point Total									**3.04E-06**					**3.20E-01**
	Exposure Medium Total										**3.07E-06**					**3.29E-01**
Sediment Total											**3.07E-06**					**3.29E-01**
Surface Water	Surface Water	Patapsco River	Ingestion	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	3.01E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.51E-09	7.01E-08	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.34E-04
				MERCURY	3.80E-05	(mg/L)	3.17E-11	(mg/kg-day)	NA	per (mg/kg-day)	--	7.40E-10	(mg/kg-day)	1.00E-04	(mg/kg-day)	7.40E-06
				SELENIUM	9.30E-03	(mg/L)	7.77E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	3.62E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	4.26E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.11E-11	3.31E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	3.76E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.74E-11	2.92E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	2.76E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.01E-10	2.14E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	3.01E-11	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.19E-10	2.34E-10	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	3.76E-11	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.74E-11	2.92E-10	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**5.02E-09**					**2.77E-04**
			Dermal	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	9.92E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.49E-08	2.31E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	7.72E-04
				MERCURY	3.80E-05	(mg/L)	1.05E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	2.44E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	2.44E-05
				SELENIUM	9.30E-03	(mg/L)	2.31E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	5.40E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.08E-04
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	1.82E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.33E-07	1.42E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	2.80E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.04E-07	2.18E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	2.02E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.48E-06	1.57E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	3.41E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.49E-06	2.65E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	2.80E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.04E-07	2.18E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**4.52E-06**					**9.04E-04**
		Exposure Point Total									**4.52E-06**					**1.18E-03**

TABLE 1.10
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Finfish	Ingestion	**METALS**												
				ARSENIC	1.44E-03	(mg/kg)	1.28E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.92E-08	2.98E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.94E-04
				MERCURY	6.84E-02	(mg/kg)	6.07E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.42E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.42E-01
				SELENIUM	2.25E+00	(mg/kg)	2.00E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	4.66E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	9.32E-02
				PAHS												
				BENZO(A)ANTHRACENE	9.91E-03	(mg/kg)	2.64E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.93E-07	2.05E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	8.75E-03	(mg/kg)	2.33E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.70E-07	1.81E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	6.41E-03	(mg/kg)	1.71E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.25E-06	1.33E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.00E-03	(mg/kg)	1.86E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.36E-06	1.45E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.75E-03	(mg/kg)	2.33E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.70E-07	1.81E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**3.16E-06**					**2.36E-01**
		Exposure Point Total									**3.16E-06**					**2.36E-01**
	Exposure Medium Total										**7.68E-06**					**2.37E-01**
Surface Water Total											**7.68E-06**					**2.37E-01**
										Total of Receptor Risks Across All Media	**1.08E-05**				Total of Receptor Hazards Across All Media	**5.66E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 1.11
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING
PATAPSCO RIVER BACKGROUND

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC*		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake		CSF		Cancer Risk	Intake		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Patapsco River	Dermal[1]	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	2.59E-06	(mg/kg)	3.96E-14	(mg/kg-day)	1.50E+05	per (mg/kg-day)	5.94E-09	9.24E-14	(mg/kg-day)	1.00E-09	(mg/kg-day)	9.24E-05
				METALS												
				ARSENIC	3.75E+00	(mg/kg)	5.74E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	8.61E-08	1.34E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.46E-04
				COBALT	1.74E+01	(mg/kg)	8.88E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	2.07E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.91E-04
				VANADIUM	2.89E+01	(mg/kg)	1.47E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.44E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	2.65E-03
				PAHS												
				BENZO(A)PYRENE	2.20E-02	(mg/kg)	1.46E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.07E-08	3.41E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	2.19E-02	(mg/kg)	1.45E-09	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.06E-08	3.38E-09	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	8.16E-03	(mg/kg)	5.83E-10	(mg/kg-day)	2.00E+00	per (mg/kg-day)	1.17E-09	1.36E-09	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.14E-07**					**3.88E-03**
		Exposure Point Total									**1.14E-07**					**3.88E-03**
		Crabs	Ingestion	**DIOXIN/FURANS**												
				DIOXIN (TEQ)	6.08E-07	(mg/kg)	4.57E-11	(mg/kg-day)	1.30E+05	per (mg/kg-day)	5.95E-06	1.07E-10	(mg/kg-day)	1.00E-09	(mg/kg-day)	1.07E-01
				METALS												
				ARSENIC	2.03E-02	(mg/kg)	1.53E-06	(mg/kg-day)	1.50E+00	per (mg/kg-day)	2.29E-06	3.56E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.19E-02
				COBALT	1.68E-01	(mg/kg)	1.27E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.95E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	9.84E-02
				VANADIUM	1.56E+00	(mg/kg)	1.17E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.74E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.48E-02
				PAHS												
				BENZO(A)PYRENE	1.61E-03	(mg/kg)	1.21E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.83E-07	2.82E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	3.88E-03	(mg/kg)	2.92E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	2.13E-06	6.82E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				PCB CONGENERS												
				TOTAL PCB's	5.64E-02	(mg/kg)	4.24E-06	(mg/kg-day)	2.00E+00	per (mg/kg-day)	8.48E-06	9.89E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**1.97E-05**					**2.72E-01**
		Exposure Point Total									**1.97E-05**					**2.72E-01**
	Exposure Medium Total										**1.98E-05**					**2.76E-01**
Sediment Total											**1.98E-05**					**2.76E-01**
Surface Water	Surface Water	Patapsco River	Dermal	**METALS**												
				ARSENIC	3.60E-03	(mg/L)	7.35E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.10E-07	1.71E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.71E-04
				MERCURY	3.80E-05	(mg/L)	7.76E-10	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-09	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.81E-05
				SELENIUM	9.30E-03	(mg/L)	1.71E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.00E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.00E-05
				PAHS												
				BENZO(A)ANTHRACENE	1.70E-05	(mg/L)	1.13E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.22E-08	2.63E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	1.50E-05	(mg/L)	1.73E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.26E-07	4.03E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	1.10E-05	(mg/L)	1.25E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	9.11E-07	2.91E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	1.20E-05	(mg/L)	2.10E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.53E-06	4.91E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	1.50E-05	(mg/L)	1.73E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.26E-07	4.03E-07	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**2.89E-06**					**6.70E-04**
		Exposure Point Total									**2.89E-06**					**6.70E-04**
		Finfish	Ingestion	**METALS**												
				ARSENIC	1.44E-03	(mg/kg)	1.08E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.62E-07	2.53E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.43E-04
				MERCURY	6.84E-02	(mg/kg)	5.15E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.20E-05	(mg/kg-day)	1.00E-04	(mg/kg-day)	1.20E-01
				SELENIUM	2.25E+00	(mg/kg)	1.69E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	3.95E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	7.90E-02
				PAHS												
				BENZO(A)ANTHRACENE	9.91E-03	(mg/kg)	7.46E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.44E-07	1.74E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	8.75E-03	(mg/kg)	6.58E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.80E-07	1.54E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	6.41E-03	(mg/kg)	4.82E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.52E-06	1.13E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				DIBENZ(A,H)ANTHRACENE	7.00E-03	(mg/kg)	5.26E-07	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.84E-06	1.23E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	8.75E-03	(mg/kg)	6.58E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.80E-07	1.54E-06	(mg/kg-day)	NA	(mg/kg-day)	--
			Exp. Route Total								**9.03E-06**					**2.00E-01**
		Exposure Point Total									**9.03E-06**					**2.00E-01**
	Exposure Medium Total										**1.19E-05**					**2.01E-01**
Surface Water Total											**1.19E-05**					**2.01E-01**
										Total of Receptor Risks Across All Media	**3.18E-05**				Total of Receptor Hazards Across All Media	**4.76E-01**

Notes:
Arsenic in crab and finfish is adjusted by 0.1 to account for the inorganic arsenic in fish and crab.
1) Dermal intake is "NA" due to no reccomended Dermal Absorption Fraction (ABS) for this Chemical. Please see Table 5.5.2

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 1.12

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	5.8E-08	1.0E-07	--	1.6E-07	ARSENIC	Skin	3.0E-04	5.4E-04	--	8.4E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.5E-06	1.7E-05	--	2.7E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	4.7E-05	7.6E-05	--	1.2E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.3E-10	3.1E-07	--	3.1E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.2E-10	4.8E-07	--	4.8E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	8.6E-10	3.5E-06	--	3.5E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	9.4E-10	5.8E-06	--	5.8E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.2E-10	4.8E-07	--	4.8E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	6.0E-08	1.1E-05	---	1.1E-05		(Total)	3.6E-04	6.3E-04	---	9.9E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	1.3E-07	--	--	1.3E-07	ARSENIC	Skin	6.9E-04	--	--	6.9E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	9.9E-02	--	--	9.9E-02
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	6.5E-02	--	--	6.5E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	4.5E-07	--	--	4.5E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	3.9E-07	--	--	3.9E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.9E-06	--	--	2.9E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.2E-06	--	--	3.2E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.9E-07	--	--	3.9E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	7.4E-06	---	---	7.4E-06		(Total for Finfish)	1.6E-01	---	---	1.6E-01
						Total Risk Across Surface Water	**1.8E-05**					**Total Hazard Index Across Surface Water**	**1.7E-01**

TABLE 1.12

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background
Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.7E-09	--	1.7E-09	DIOXIN (TEQ)	Developmental	--	2.6E-05	--	2.6E-05
			METALS					**METALS**					
			ARSENIC	--	2.5E-08	--	2.5E-08	ARSENIC	Skin	--	1.3E-04	--	1.3E-04
			COBALT	--	--	--	NA	COBALT	Blood	0.0E+00	2.0E-04	--	2.0E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	0.0E+00	7.5E-04	--	7.5E-04
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	3.0E-09	--	3.0E-09	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	3.0E-09	--	3.0E-09	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	3.3E-10	--	3.3E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	3.3E-08	---	3.3E-08		(Total)	---	1.1E-03	---	1.1E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	4.9E-06	--	--	4.9E-06	DIOXIN (TEQ)	Developmental	8.8E-02	--	--	8.8E-02
			METALS					**METALS**					
			ARSENIC	1.9E-06	--	--	1.9E-06	ARSENIC	Skin	9.7E-03	--	--	9.7E-03
			COBALT	--	--	--	NA	COBALT	Blood	8.1E-02	--	--	8.1E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	4.5E-02	--	--	4.5E-02
			PAHS					**PAHS**					
			BENZO(A)PYRENE	7.2E-07	--	--	7.2E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.8E-06	--	--	1.8E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	7.0E-06	--	--	7.0E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	1.6E-05	---	---	1.6E-05		(Total for Crabs)	2.2E-01	---	---	2.2E-01
							Total Risk Across Sediment						**Total Hazard Index Across Sediment**	**2.2E-01**
							Total Risk Across All Media and All Exposure Routes						**Total Hazard Index Across All Media and All Exposure Routes**	**3.9E-01**

TABLE 1.13

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	1.5E-08	4.0E-08	--	5.5E-08	ARSENIC	Skin	2.3E-04	6.2E-04	--	8.6E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	7.4E-06	2.0E-05	--	2.7E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.6E-05	8.7E-05	--	1.2E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.0E-10	3.6E-07	--	3.6E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	9.1E-11	5.5E-07	--	5.5E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	6.7E-10	4.0E-06	--	4.0E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	7.3E-10	6.7E-06	--	6.7E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	9.1E-11	5.5E-07	--	5.5E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	1.7E-08	1.2E-05	---	1.2E-05		(Total)	2.8E-04	7.3E-04	---	1.0E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	5.1E-08	--	--	5.1E-08	ARSENIC	Skin	7.9E-04	--	--	7.9E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.1E-01	--	--	1.1E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	7.5E-02	--	--	7.5E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	5.1E-07	--	--	5.1E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.5E-07	--	--	4.5E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.3E-06	--	--	3.3E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.6E-06	--	--	3.6E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	4.5E-07	--	--	4.5E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	8.4E-06	---	---	8.4E-06		(Total for Finfish)	1.9E-01	---	---	1.9E-01
						Total Risk Across Surface Water	**2.1E-05**					**Total Hazard Index Across Surface Water**	**1.9E-01**

TABLE 1.13

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	2.5E-09	--	2.5E-09	DIOXIN (TEQ)	Developmental	--	1.2E-04	--	1.2E-04
			METALS					**METALS**					
			ARSENIC	--	3.6E-08	--	3.6E-08	ARSENIC	Skin	--	5.7E-04	--	5.7E-04
			COBALT	--	--	--	NA	COBALT	Blood	0.0E+00	8.7E-04	--	8.7E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	0.0E+00	3.4E-03	--	3.4E-03
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	1.3E-08	--	1.3E-08	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.3E-08	--	1.3E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	4.9E-10	--	4.9E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	6.6E-08	---	6.6E-08		(Total)	---	4.9E-03	---	4.9E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	1.9E-06	--	--	1.9E-06	DIOXIN (TEQ)	Developmental	1.0E-01	--	--	1.0E-01
			METALS					**METALS**					
			ARSENIC	7.2E-07	--	--	7.2E-07	ARSENIC	Skin	1.1E-02	--	--	1.1E-02
			COBALT	--	--	--	NA	COBALT	Blood	9.3E-02	--	--	9.3E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	5.2E-02	--	--	5.2E-02
			PAHS					**PAHS**					
			BENZO(A)PYRENE	8.3E-07	--	--	8.3E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.0E-06	--	--	2.0E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	2.7E-06	--	--	2.7E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	8.1E-06	---	---	8.1E-06		(Total for Crabs)	2.6E-01	---	---	2.6E-01
							Total Risk Across Sediment	**8.2E-06**					**Total Hazard Index Across Sediment**	**2.6E-01**
							Total Risk Across All Media and All Exposure Routes	**2.9E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**4.5E-01**

TABLE 1.14

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	4.5E-09	1.5E-08	--	1.9E-08	ARSENIC	Skin	2.3E-04	7.7E-04	--	1.0E-03
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	7.4E-06	2.4E-05	--	3.2E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	3.6E-05	1.1E-04	--	1.4E-04
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	3.1E-11	1.3E-07	--	1.3E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	2.7E-11	2.0E-07	--	2.0E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	2.0E-10	1.5E-06	--	1.5E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.2E-10	2.5E-06	--	2.5E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.7E-11	2.0E-07	--	2.0E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	5.0E-09	4.5E-06	---	4.5E-06		(Total)	2.8E-04	9.0E-04	---	1.2E-03
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	1.9E-08	--	--	1.9E-08	ARSENIC	Skin	9.9E-04	--	--	9.9E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.4E-01	--	--	1.4E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	9.3E-02	--	--	9.3E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	1.9E-07	--	--	1.9E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.7E-07	--	--	1.7E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.2E-06	--	--	1.2E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	1.4E-06	--	--	1.4E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	1.7E-07	--	--	1.7E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	3.2E-06	---	---	3.2E-06		(Total for Finfish)	2.4E-01	---	---	2.4E-01
						Total Risk Across Surface Water	**7.7E-06**					**Total Hazard Index Across Surface Water**	**2.4E-01**

TABLE 1.14

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	1.3E-09	--	1.3E-09	DIOXIN (TEQ)	Developmental	--	2.0E-04	--	2.0E-04
			METALS					**METALS**					
			ARSENIC	--	1.8E-08	--	1.8E-08	ARSENIC	Skin	--	9.6E-04	--	9.6E-04
			COBALT	--	--	--	NA	COBALT	Blood	0.0E+00	1.5E-03	--	1.5E-03
			VANADIUM	--	--	--	NA	VANADIUM	Hair	0.0E+00	5.7E-03	--	5.7E-03
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	6.9E-09	--	6.9E-09	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	6.8E-09	--	6.8E-09	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	2.5E-10	--	2.5E-10	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	3.4E-08	---	3.4E-08		(Total)	---	8.3E-03	---	8.3E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	7.0E-07	--	--	7.0E-07	DIOXIN (TEQ)	Developmental	1.3E-01	--	--	1.3E-01
			METALS					**METALS**					
			ARSENIC	2.7E-07	--	--	2.7E-07	ARSENIC	Skin	1.4E-02	--	--	1.4E-02
			COBALT	--	--	--	NA	COBALT	Blood	1.2E-01	--	--	1.2E-01
			VANADIUM	--	--	--	NA	VANADIUM	Hair	6.5E-02	--	--	6.5E-02
			PAHS					**PAHS**					
			BENZO(A)PYRENE	3.1E-07	--	--	3.1E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	7.5E-07	--	--	7.5E-07	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	1.0E-06	--	--	1.0E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	3.0E-06	---	---	3.0E-06		(Total for Crabs)	3.2E-01	---	---	3.2E-01
							Total Risk Across Sediment	**3.1E-06**					**Total Hazard Index Across Sediment**	**3.3E-01**
							Total Risk Across All Media and All Exposure Routes	**1.1E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**5.7E-01**

TABLE 1.15

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Patapsco River	**METALS**					**METALS**					
			ARSENIC	--	1.1E-07	--	1.1E-07	ARSENIC	Skin	--	5.7E-04	--	5.7E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	--	1.8E-05	--	1.8E-05
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	--	8.0E-05	--	8.0E-05
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	--	8.2E-08	--	8.2E-08	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	--	1.3E-07	--	1.3E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	--	9.1E-07	--	9.1E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.5E-06	--	1.5E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	--	1.3E-07	--	1.3E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total)	---	2.9E-06	---	2.9E-06		(Total)	---	6.7E-04	---	6.7E-04
	Finfish	Patapsco River	**METALS**					**METALS**					
			ARSENIC	1.6E-07	--	--	1.6E-07	ARSENIC	Skin	8.4E-04	--	--	8.4E-04
			MERCURY	--	--	--	NA	MERCURY	Central Nervous System	1.2E-01	--	--	1.2E-01
			SELENIUM	--	--	--	NA	SELENIUM	Hair and Skin	7.9E-02	--	--	7.9E-02
			PAHS					**PAHS**					
			BENZO(A)ANTHRACENE	5.4E-07	--	--	5.4E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.8E-07	--	--	4.8E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.5E-06	--	--	3.5E-06	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	3.8E-06	--	--	3.8E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	4.8E-07	--	--	4.8E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			(Total for Finfish)	9.0E-06	---	---	9.0E-06		(Total for Finfish)	2.0E-01	---	---	2.0E-01
						Total Risk Across Surface Water	**1.2E-05**			**Total Hazard Index Across Surface Water**			**2.0E-01**

TABLE 1.15

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

RISK ASSESSMENT FOR SOURCE CHARACTERIZATION AND SITE PLANNING

PATAPSCO RIVER BACKGROUND

Location: Patapsco River Background

Scenario Timeframe: Current
Receptor Population: Waterman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Sediment	Sediment	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	--	5.9E-09	--	5.9E-09	DIOXIN (TEQ)	Developmental	--	9.2E-05	--	9.2E-05
			METALS					**METALS**					
			ARSENIC	--	8.6E-08	--	8.6E-08	ARSENIC	Skin	--	4.5E-04	--	4.5E-04
			COBALT	--	--	--	NA	COBALT	Blood	0.0E+00	6.9E-04	--	6.9E-04
			VANADIUM	--	--	--	NA	VANADIUM	Hair	0.0E+00	2.6E-03	--	2.6E-03
			PAHS					**PAHS**					
			BENZO(A)PYRENE	--	1.1E-08	--	1.1E-08	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	--	1.1E-08	--	1.1E-08	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	--	1.2E-09	--	1.2E-09	TOTAL PCB's	NA	--	--	--	NA
			(Total)	---	1.1E-07	---	1.1E-07		(Total)	---	3.9E-03	---	3.9E-03
	Crabs	Patapsco River	**DIOXIN/FURANS**					**DIOXIN/FURANS**					
			DIOXIN (TEQ)	5.9E-06	--	--	5.9E-06	DIOXIN (TEQ)	Developmental	1.1E-01	--	--	1.1E-01
			METALS					**METALS**					
			ARSENIC	2.3E-06	--	--	2.3E-06	ARSENIC	Skin	1.2E-02	--	--	1.2E-02
			COBALT	--	--	--	NA	COBALT	Blood	9.8E-02	--	--	9.8E-02
			VANADIUM	--	--	--	NA	VANADIUM	Hair	5.5E-02	--	--	5.5E-02
			PAHS					**PAHS**					
			BENZO(A)PYRENE	8.8E-07	--	--	8.8E-07	BENZO(A)PYRENE	NA	--	--	--	NA
			DIBENZ(A,H)ANTHRACENE	2.1E-06	--	--	2.1E-06	DIBENZ(A,H)ANTHRACENE	NA	--	--	--	NA
			PCB CONGENERS					**PCB CONGENERS**					
			TOTAL PCB's	8.5E-06	--	--	8.5E-06	TOTAL PCB's	NA	--	--	--	NA
			(Total for Crabs)	2.0E-05	---	---	2.0E-05		(Total for Crabs)	2.7E-01	---	---	2.7E-01
						Total Risk Across Sediment	**2.0E-05**					**Total Hazard Index Across Sediment**	**2.8E-01**
						Total Risk Across All Media and All Exposure Routes	**3.2E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**4.8E-01**

TABLE 1.16
BACKGROUND CONCENTRATIONS OF CHEMICALS OF CONCERN IN THE SEDIMENT

Chemical	Concentrations Used in the Risk Assessment: Patapsco River Background (mg/kg)			Background Threshold Values Based on Cumulative Frequency Distribution Analysis
	Mean	Median	Maximum	
DIOXINS				
TCDD TEQ (ND = DL)	4.42E-06	2.59E-06	1.15E-05	1.49E-05
METALS				
ARSENIC	6.22E+00	3.75E+00	1.62E+01	2.60E+01
CADMIUM	4.17E-01	1.75E-01	1.60E+00	2.00E+00
CHROMIUM	6.17E+01	3.17E+01	2.25E+02	4.20E+01
COPPER	2.70E+01	1.09E+01	1.05E+02	1.05E+02
LEAD	3.35E+01	1.37E+01	1.21E+02	1.75E+02
MERCURY	1.22E-01	4.80E-02	3.90E-01	5.00E-01
ZINC	1.32E+02	6.19E+01	4.29E+02	6.68E+02
PAHS				
BENZO(A)ANTHRACENE	2.22E-01	2.60E-02	1.20E+00	1.00E+01
BENZO(A)PYRENE	2.03E-01	2.20E-02	1.10E+00	1.00E+01
BENZO(B)FLUORANTHENE	3.43E-01	2.45E-02	1.90E+00	1.00E+01
DIBENZO(A,H)ANTHRACENE	6.06E-02	2.19E-02	2.60E-01	1.00E+00
INDENO(1,2,3-CD)PYRENE	1.73E-01	3.50E-02	8.70E-01	7.40E+00
TOTAL HMW PAH (ND = DL)	1.64E+00	2.07E-01	8.67E+00	5.00E+01
TOTAL LMW PAH (ND = DL)	2.75E+00	8.06E-02	1.56E+01	2.00E+01
PCBS				
TOTAL PCBS (ND = DL)	1.70E-02	8.16E-03	5.83E-02	1.42E-01

TABLE 2.1
EXPOSURE POINT CONCENTRATIONS (EPCS) IN SEDIMENT OF THE COKE POINT OFFSHORE AREA

Analyte	Sediment Concentrations Used in the Risk Assessment Coke Point Offshore Area (mg/kg dry wt.)				Sediment Concentrations Based on Kriging (mg/kg dry wt.)	
	Frequency of Detection	Mean of Detected Concentrations	Maximum	95 UCLM	Mean	95 UCLM
DIOXINS						
TCDD TEQ (ND = DL)	27/27	1.34E-05	7.77E-05	2.59E-05	--	--
METALS						
ARSENIC	37/37	2.34E+01	7.20E+01	2.76E+01	2.07E+01	3.65E+01
CADMIUM	37/37	2.37E+00	7.70E+00	2.97E+00	1.93E+00	3.54E+00
CHROMIUM	37/37	2.05E+02	5.04E+02	2.36E+02	1.91E+02	3.14E+02
COPPER	37/37	1.38E+02	5.95E+02	1.72E+02	1.12E+02	2.14E+02
LEAD	37/37	2.75E+02	1.28E+03	3.51E+02	1.99E+02	4.00E+02
MERCURY	37/37	5.67E-01	1.70E+00	6.86E-01	4.97E-01	8.59E-01
ZINC	37/37	7.88E+02	2.73E+03	9.99E+02	6.58E+02	1.22E+03
PAHS						
BENZO(A)ANTHRACENE	37/37	9.28E+00	6.10E+01	1.37E+01	3.04E+00	1.32E+01
BENZO(A)PYRENE	37/37	8.93E+00	5.60E+01	1.25E+01	3.09E+00	1.38E+01
BENZO(B)FLUORANTHENE	37/37	9.30E+00	5.30E+01	1.27E+01	4.56E+00	1.38E+01
DIBENZO(A,H)ANTHRACENE	37/37	1.43E+00	6.30E+00	2.46E+00	6.61E-01	2.17E+00
INDENO(1,2,3-CD)PYRENE	37/37	5.01E+00	2.50E+01	6.97E+00	2.29E+00	7.64E+00
TOTAL HMW PAH (ND = DL)	37/37	6.17E+01	2.88E+02	8.66E+01	2.71E+01	9.92E+01
TOTAL LMW PAH (ND = DL)	37/37	2.54E+02	7.28E+03	2.20E+03	1.92E+01	1.08E+02
PCBS						
TOTAL PCBS (ND = DL)	26/27	1.53E-01	4.89E-01	2.65E-01	9.25E-02	2.50E-01

TABLE 4.1
Comparison of Summation Groups Based on Different Interpretations for Non-Detection Results

Chemical	Media	Risk units	Site	Revised UCLM	
				N	UCLM95
Dioxins					
WHO TEQ (ND = 0)	Sediment	mg/kg	Coke Point Offshore Area	27	8.53E-06
WHO TEQ (ND = 1/2DL)	Sediment	mg/kg	Coke Point Offshore Area	27	1.27E-05
WHO TEQ (ND = DL)	Sediment	mg/kg	Coke Point Offshore Area	27	2.59E-05
PAHs					
Total HMW PAH (ND = 0)	Sediment	mg/kg	Coke Point Offshore Area	37	86.53
Total HMW PAH (ND = 1/2DL)	Sediment	mg/kg	Coke Point Offshore Area	37	86.58
Total HMW PAH (ND = DL)	Sediment	mg/kg	Coke Point Offshore Area	37	86.63
Total LMW PAH (ND = 0)	Sediment	mg/kg	Coke Point Offshore Area	37	2199
Total LMW PAH (ND = 1/2DL)	Sediment	mg/kg	Coke Point Offshore Area	37	2199
Total LMW PAH (ND = DL)	Sediment	mg/kg	Coke Point Offshore Area	37	2199
Total HMW PAH (ND = 0)	Surface Water	ug/L	Coke Point Offshore Area	96	10.52
Total HMW PAH (ND = 1/2DL)	Surface Water	ug/L	Coke Point Offshore Area	96	5.447
Total HMW PAH (ND = DL)	Surface Water	ug/L	Coke Point Offshore Area	96	6.125
Total LMW PAH (ND = 0)	Surface Water	ug/L	Coke Point Offshore Area	96	2.207
Total LMW PAH (ND = 1/2DL)	Surface Water	ug/L	Coke Point Offshore Area	96	1.852
Total LMW PAH (ND = DL)	Surface Water	ug/L	Coke Point Offshore Area	96	2.264
Total HMW PAH (ND = 0)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.063
Total HMW PAH (ND = 1/2DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.101
Total HMW PAH (ND = DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.143
Total LMW PAH (ND = 0)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.069
Total LMW PAH (ND = 1/2DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.124
Total LMW PAH (ND = DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.200
Total HMW PAH (ND = 0)	Crab Mustard	mg/kg	Coke Point Offshore Area	4	0.199
Total HMW PAH (ND = 1/2DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	4	0.326
Total HMW PAH (ND = DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	4	0.463
Total LMW PAH (ND = 0)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.338
Total LMW PAH (ND = 1/2DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.373
Total LMW PAH (ND = DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.419
Total HMW PAH (ND = 0)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.008
Total HMW PAH (ND = 1/2DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.008
Total HMW PAH (ND = DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.008
Total LMW PAH (ND = 0)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.018
Total LMW PAH (ND = 1/2DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.084
Total LMW PAH (ND = DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.151
Total HMW PAH (ND = 0)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.005
Total HMW PAH (ND = 1/2DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.050
Total HMW PAH (ND = DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.095
Total LMW PAH (ND = 0)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.093
Total LMW PAH (ND = 1/2DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.121
Total LMW PAH (ND = DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.163
Total HMW PAH (ND = 0)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.088
Total HMW PAH (ND = 1/2DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.143
Total HMW PAH (ND = DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.203
Total LMW PAH (ND = 0)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.119

TABLE 4.1
Comparison of Summation Groups Based on Different Interpretations for Non-Detection Results

Chemical	Media	Risk units	Site	Revised UCLM	
				N	UCLM95
Total LMW PAH (ND = 1/2DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.171
Total LMW PAH (ND = DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.241
PCBs					
Total PCBs (ND = 0)	Sediment	mg/kg	Coke Point Offshore Area	27	0.18
Total PCBs (ND = 1/2DL)	Sediment	mg/kg	Coke Point Offshore Area	27	0.257
Total PCBs (ND = DL)	Sediment	mg/kg	Coke Point Offshore Area	27	0.265
Total PCBs (ND=0)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.030397698
Total PCBs (ND=1/2DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.054474578
Total PCBs (ND=DL)	Crab Meat	mg/kg	Coke Point Offshore Area	5	0.079059948
Total PCBs (ND=0)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.601212636
Total PCBs (ND=1/2DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.661664133
Total PCBs (ND=DL)	Crab Mustard	mg/kg	Coke Point Offshore Area	5	0.722376409
Total PCBs (ND=0)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.178741731
Total PCBs (ND=1/2DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.189394249
Total PCBs (ND=DL)	Fish Filet	mg/kg	Coke Point Offshore Area	5	0.200066631
Total PCBs (ND=0)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.520209521
Total PCBs (ND=1/2DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.530209521
Total PCBs (ND=DL)	Fish Whole Body	mg/kg	Coke Point Offshore Area	5	0.540209521
Total PCBs (ND=0)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.13694982
Total PCBs (ND=1/2DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.167816628
Total PCBs (ND=DL)	Edible Crab	mg/kg	Coke Point Offshore Area	5	0.199145687

APPENDIX H

BIOACCUMULATION STUDY

EA Project No. 14534.17

LABORATORY BIOACCUMULATION AND FIELD-COLLECTED TISSUE STUDY OF THE OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT

BALTIMORE, MARYLAND

May 16, 2011

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LIST OF ATTACHMENTS (SEE ENCLOSED CD)

NUMBER	TITLE
A	Work Plan for Field and Laboratory Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point, Baltimore, Maryland
B	Sediment and Tissue Sample Lists
C	Field Data Sheets from Fall 2010 Sediment and Tissue Sampling Event
D	Chemical Analytical Data Reports
E	EA Ecotoxicological Bioaccumulation Studies Report

EXECUTIVE SUMMARY

The Sparrows Point Facility is located on approximately 2,300 acres on the north side of the Patapsco River in Baltimore County, Maryland, approximately 9 miles southeast of downtown Baltimore. The Maryland Port Administration (MPA) has expressed an interest in acquiring the Coke Point Peninsula (Coke Point) on the Sparrows Point property as a potential site for a Dredged Material Containment Facility (DMCF) for placement of dredged material from channels in the Baltimore Harbor. A key component of MPA's evaluation of environmental conditions at the site is an understanding of the potential for bioaccumulation of chemicals from sediments into the tissue of aquatic organisms living at the site. Under contract to the Maryland Environmental Service (MES), EA Engineering, Science, and Technology, Inc. (EA) conducted studies of bioaccumulation in the Coke Point Offshore Area and background areas in the Patapsco River. Laboratory bioaccumulation studies and field collected fish and crab tissue provides site-specific information regarding bioaccumulation from sediment into aquatic organisms, such as fish, crab, and benthos that could be consumed by wildlife or humans.

Sediment samples were collected from the Coke Point Offshore Area and from Sollers Point within the Patapsco River background area. Sediment was used in 28-day bioaccumulation tests in which clams and worms were exposed to sediment in a controlled environment. At the end of this period, organisms were removed from the sediment, depurated, and tissues were analyzed for lipids, metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Results from Coke Point Offshore Area were statistically compared to Patapsco River background concentrations to evaluate the potential for bioaccumulative uptake and to calculate the bioaccumulation factors (BAFs).

White perch (*Morone americana*) and blue crab (*Callinectes sapidus*) were collected from the Coke Point Offshore Area and Sollers Point (the Patapsco River Background Area). Specimens were processed to create composites, each consisting of tissue from multiple individual organisms. Chemical analyses of lipids, metals, PAHs, and PCBs were each performed on whole body fish tissue, fish filets, crab meat, and crab digestive gland (mustard). Results for the crab meat and mustard were used to calculate total edible crab concentrations. Concentration data were analyzed statistically to provide a comparison between the two areas, and to create summary statistics that conservatively characterize concentrations in crab and fish tissue samples. Because arsenic uptake is of particular concern at this site, analytical testing also included speciation of arsenic to determine the ratio of organic to inorganic forms.

The laboratory bioaccumulation provided strong evidence that metals, PAHs, and PCBs in Coke Point sediments are available for uptake. Statistical comparisons indicated that metals, PAHs, and PCBs bioaccumulate in greater amounts from Coke Point sediments than from sediments in the background area in the Patapsco River (Sollers Point). This indicated that the Coke Point Offshore Area results in a higher level of exposure than background area and increases the potential for these chemicals to enter the local food chain, particularly in the lower trophic levels.

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LABORATORY BIOACCUMULATION AND FIELD-COLLECTED TISSUE STUDY

IN SUPPORT OF THE OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT

The Sparrows Point Facility is located on approximately 2,300 acres on the north side of the Patapsco River in Baltimore County, Maryland, approximately 9 miles southeast of downtown Baltimore. The Maryland Port Administration (MPA) has expressed an interest in acquiring the Coke Point Peninsula (Coke Point) on the Sparrows Point property as a potential site for a Dredged Material Containment Facility (DMCF) for placement of dredged material from channels in the Baltimore Harbor. A key component of MPA's evaluation of environmental conditions at the site is an understanding of the potential for bioaccumulation of chemicals from sediments into the tissue of aquatic organisms. Under contract to the Maryland Environmental Service (MES), EA Engineering, Science, and Technology, Inc. (EA) conducted studies of bioaccumulation in the Coke Point Offshore Area and background areas in the Patapsco River. Laboratory bioaccumulation studies and field collection of tissue were conducted to provide site-specific information regarding bioaccumulation from sediment into aquatic organisms such as fish, crab, and benthos that could be consumed by wildlife or humans. A work plan was prepared (**Attachment A**) and field work, lab tests, chemical analyses, and data validation were conducted between October and December 2010.

1.0 PURPOSE

To evaluate the potential for bioaccumulation of chemicals from the sediments in the Offshore Area and the Coke Point Penninsula, this study included analysis of tissue concentrations from laboratory bioaccumulation tests and from field collected organisms. Laboratory studies were conducted to identify whether chemical constituents have greater potential to bioaccumulate compared to background locations. Fish and crabs collected in field studies of the Coke Point Offshore Area and Background Area provide information on tissue concentrations resulting from organisms moving freely within and between these environments as well as using more far-field habitats. This report summarizes field collection of crab and fish tissue for chemical analysis; laboratory evaluation of contaminant bioaccumulation from sediment; and calculation of summary statistics such as the 95% upper confidence limits on the mean (95%UCLM) using the site-specific field and laboratory tissue data. The U.S. Environmental Protection Agency (USEPA) and Maryland Department of the Environment (MDE) reviewed the study design prior to implementation, and agency comments were used to strengthen the overall project.

2.0 LABORATORY BIOACCUMULATION STUDIES

The laboratory studies investigated the link between Coke Point sediment concentrations and increased contributions to aquatic species from prolonged and multiple exposures over background The bioaccumulation studies were designed to identify potential concentrations of chemicals in aquatic prey items/food sources exposed to site and background sediments. Laboratory bioaccumulation studies provided data that were used to determine if Coke Point

sediments are associated with higher bioaccumulation of chemicals of concern (COCs) than background area sediments.

2.1 STUDY DESIGN

Laboratory bioaccumulation tests were conducted using clams and aquatic worms exposed to sediment composite samples representative of surface sediment from the Coke Point Offshore Area, the background area, and a control (**Table 1**). Surface sediment was collected from five locations around Coke Point and three locations in the background area via grab sampler (**Figure 4**); sufficient volume of sediment was collected to support chemical analytical and laboratory bioaccumulation exposures (**Table 1**). Individual locations with elevated sediment concentration (representing 95% UCLM) were targeted for sediment collection. The goal was to create a composite sample which contained levels of metals, PAHs, and PCBs approximating the 95% UCLM of previously sampled sediments at Coke Point. Laboratory bioaccumulation studies focused on these compounds because screening identified these chemicals as those most likely to bioaccumulate to significant levels based on previously collected data. Dioxins, VOCs, inorganics (cyanide) and organotins compounds were detected in Coke Point Offshore Area sediments but were not included in site-specific bioaccumulation studies because initial screening indicated that these chemicals were likely to bioaccumulate to less significant levels than metals, PAHs, and PCBs.

Sediment sample locations in the Coke Point Offshore Area were selected based on chemical concentrations observed in previous sampling (EA 2009). For each chemical, or suite of chemicals (e.g., PAHs), the previous sampling location results were examined for concentrations of COCs similar to or slightly higher than those that would represent 95%UCLM concentrations for surface sediment (**Table 2**). From these, five sample locations were selected for collection of discrete surface sediment samples: BH-SED-03C, BH-SED-10, SP09-02, SP09-03, and SB-1. Sample coordinates are listed in **Table 3**. Background stations EH-2, EH-3, and EH-4, (located in the vicinity of Sollers Point) were selected for sediment sampling because these areas previously demonstrated relatively low chemical concentrations consistent with those considered representative of background.

Sediment sampling was conducted from September 21 through 23, 2010. Discrete sediment samples were collected from each of the selected locations using a Ponar sampler. Each discrete sediment sample was homogenized and subsampled. A portion from each location was placed in separate jars corresponding to each analysis, preserved, and shipped to the lab for rapid turn-around analysis (7 day turn-around-time) in accordance with the work plan (**Attachment A**). The remaining sediment was stored in 5-gallon sealed plastic containers at 4 degrees Celsius (°C) at EA's Ecotooxicology laboratory. Each sample was labeled with sample number, location, date, initials of the sampling crew, and media. The field sample list is presented in **Attachment B**. The control sediment was representative of the native sediment from which the clams and worms used in the bioaccumulation exposures were collected and shipped to the laboratory. The holding time for the sediment samples was initiated at the time of sample collection.

Following receipt of analytical data for the discrete samples from the Coke Point and background locations, results were evaluated to determine which surface sediment samples should be composited for the bioaccumulation exposures.

For Coke Point Offshore Area sediments, the composite was composed of 30% sediment from BH-SED-03C and 70% sediment from SP09-03-00-10A by volume. For the Patapsco River Background Area, the composite was composed entirely of sediment from EH3-00-10. Sediments for use in the laboratory bioaccumulation exposures were composited on October 1, 2010. The sediment composites were sub-sampled and analyzed for metals, PAHs, and PCBs. Remaining material was submitted to EA's Ecotoxicology Laboratory for use in laboratory bioaccumulation tests. Equipment that came into direct contact with sediment during sampling and compositing was decontaminated prior to deployment in the field and between each sampling location to minimize cross-contamination. This included the Ponar grab sampler and stainless steel processing equipment (spoons, knives, bowls, etc.).

2.1.1.1 Bioaccumulation Test Methods

The 28-day laboratory bioaccumulation tests were conducted as static renewal assays for clams (*Macoma nasuta*) and aquatic worms (*Nereis virens*) exposed to sediment composites for Coke Point and the background area. The aquatic organisms used in the bioaccumulation tests were selected because they ingest sediments and are expected to survive equally well in a wide range of chemical concentrations as well as in control and reference sediments. They are also standard organisms as designated by USEPA for use in laboratory bioaccumulation studies. The laboratory bioaccumulation study report is included as **Attachment E**.

Methodology for the bioaccumulation studies followed EA's standard operating procedures (EA 2006) which are in accordance with USEPA guidance (2000a) and USEPA/USACE guidance (1991, 1998). The *N. virens* bioaccumulation test was conducted in 10-gallon aquaria with 6.5 liters (L) of sediment and 26 L of overlying water per aquarium. The *M. nasuta* bioaccumulation test was conducted in 5-gallon aquaria with 4 L of sediment and 11.5 L of overlying water per aquarium. There were five replicates per background and test sediment, and three replicates per control sediment. The number of organisms used in the bioaccumulation tests was dictated by the minimum amount of tissue required for analysis. Based on analytical biomass requirements, 25 organisms were randomly transferred into each replicate chamber for *N. virens* testing, and 50 organisms were randomly transferred into each replicate chamber for *M. nasuta* testing.

During the 28-day exposure period, the test chambers were maintained at a target temperature of 20±1°C for *N. virens* and 12±1°C for *M. nasuta*, with a 16-hour light/8-hour dark photoperiod. Gentle aeration was provided to each aquarium throughout the test period. The organisms were not fed during the exposure period. Observations of mortality and abnormal organism behavior were recorded daily, and dead organisms were removed, as observed, from the test chambers.

After 28 days of exposure, surviving organisms were recovered and placed in holding tanks containing artificial sea water and no sediment to purge their digestive tracts, called depuration. At the end of the 24-hour depuration period, the shells of the clams were rinsed with de-ionized (DI) water, the clams were shucked, and the soft tissues and liquids inside the shell were placed into pre-cleaned glass jars. Worms were rinsed with DI water to remove the external salts (originating from the purge chambers) and were placed directly into pre-cleaned glass jars. Tissues for each replicate were placed into separate jars, labeled, and frozen until delivered to the analytical laboratory.

2.1.1.2 Analytical Testing

Discrete sediment samples were analyzed for metals, PCBs, PAHs, and lipids on a rapid-turn-around basis. Results were evaluated to identify one or more sediment samples which were composited to provide a representative distribution of metals, PCBs, and PAH concentrations for bioaccumulation testing. Results were also evaluated to identify the most appropriate background sample or background composite combination for bioaccumulation testing. The sediment composite and one background composite were also analyzed for metals, PAHs, and PCBs. Analytical project limits for sediment samples are presented in the work plan (**Attachment A**). The composite sediment was also analyzed for hexavalent chromium. Chromium speciation was included to provide site-specific data regarding the form of chromium. Analytical and data validation reports are included as **Attachment D**.

A total of 5 replicate bioaccumulation exposures were run for each sample. Clam and worm tissue was harvested from each replicate exposure chamber. The tissue in each replicate chamber was composited to create a sample for that replicate. Each of 5 replicate tissue samples were submitted for chemical analysis for metals, PAHs, PCBs, and lipids. Two of the five replicate samples for each species from each location (site and background) were submitted for arsenic speciation. Arsenic speciation was included to provide site-specific data regarding the form of arsenic (i.e., organic vs. inorganic). Control tissue and pre-test tissue was also analyzed for COCs; per standard test protocols, control and pre-test tissues consisted of only three replicates. Pre-test tissue represents organism tissue upon receipt at the ecotoxicology laboratory (prior to test initiation). These tissues originate from organisms that are sacrificed from each shipment and subsequently frozen. These organisms are not exposed to test sediments, but contaminants in their tissues would represent baseline contaminants that accumulated in their natural environment. Natural sediments from the organism collection sites were used as laboratory controls in the bioaccumulation testing. Control sediment used in the *N. virens* test was collected from the Damariscotta River, Booth Bay Harbor, Maine. The sediment used in the clam bioaccumulation test was collected from Tomales Bay, California.

2.1.1.3 Data Analysis

Analytical data were validated by Environmental Data Services (EDS), Inc. following procedures developed by USEPA (USEPA 1992). Data were used to prepare descriptive summary statistics, including the maximum detected value and 95% UCLM for each tissue type. The 95% UCLM was calculated using the student *t*-statistic as

$$95\%\ \text{UCLM} = \bar{x} + t_{[.95,n-1]} \frac{s_x}{\sqrt{n}}$$

where

$\bar{x}$	= sample mean of concentration data
s_x	= sample standard deviation of concentration data
n	= number of sample replicates.
$t_{[.95,n-1]}$	= 95% percentile of the *t*-distribution with *n-1* degrees of freedom

In cases where sample size was too limited to derive a 95% UCLM, the maximum detected concentration was used. For non-detected concentrations, half of the reporting limit was utilized.

Data were also used to perform statistical comparisons between sites. Statistical comparisons were made between results for the Coke Point Offshore Area and the Patapsco River Background Area, as well as between each of these areas and the pre-test results. Nonparametric comparisons were performed using both the Quantile test and the Wilcox rank-sum test at the 95% significance level in order to test for differences in both the upper tails and the central tendency of the sample data sets.

Sediment and tissue data were combined to derive sediment-to-biota bioaccumulation factors (BAFs). The concentration detected in each tissue sample was divided by the concentration in sediment used to perform the bioaccumulation test. For each tissue type, BAFs were statistically analyzed to determine the 95% UCLM_{BAF} for each chemical. The 95% UCLM_{BAF} was calculated using the student *t*-statistic as

$$95\%\ \text{UCLM}_{\text{BAF}} = \overline{BAF} + t_{[.95, n_{BAF}-1]} \frac{s_{BAF}}{\sqrt{n_{BAF}}}$$

where

$\overline{BAF}$	= sample mean BAF
s_{BAF}	= sample standard deviation of BAF replicates
n_{BAF}	= number of BAF sample replicates.
$t_{[.95, n_{BAF}-1]}$	= 95% percentile of the *t*-distribution with *n-1* degrees of freedom

In cases where sample size was too limited to derive a 95% UCLM_{BAF}, the maximum BAF was used. If a constituent was not detected in the tissues samples, BAFs were not calculated.

It should be noted that the use of biota-sediment bioaccumulation factor (BSAFs) instead of BAFs was considered for this study. BSAFs are similar to BAFs, but include normalization for lipid and organic carbon content. This accounts for the fact that carbon may bind compounds such as PAHs and PCBs in sediment and make them less available for uptake and that organic contaminants are preferentially bioaccumulated in organism lipids. Use of BSAFs is most appropriate when applying bioaccumulation factors between sites with different carbon contents or species with different lipid contents. Since the BAFs developed from Coke Point data are being applied to Coke Point data, this is not necessary, especially since clam and worm tissue demonstrated relatively comparable lipid levels below 1%. Also, measurements of organic carbon at Coke Point are skewed by the high contribution of carbon in contaminants to the total carbon value in sediments. In some cases, it is possible to attribute over half of the carbon detected to the contaminants themselves.

3.0 FIELD-COLLECTED FISH AND CRAB TISSUE

The field studies provide site-specific data necessary to determine the potential for bioaccumulation of Coke Point COCs (i.e., metals, PAHs, PCBs) into crabs and fish caught around Coke Point Peninsula and in the Patapsco River Background Area. The site-specific

tissue data were also used to determine if there is a statistically significant difference in tissue concentrations between the Coke Point Offshore Area and Patapsco River Background Areas. Field collected tissue provides a reliable indicator of exposures likely to be experienced by humans and wildlife catching and ingesting fish and crab in the area sampled.

3.1 STUDY DESIGN

Crab and Fish tissue was collected from the offshore area around Coke Point in locations known to contain elevated concentrations of chemicals in surface (**Figure 3**). Previous studies of Coke Point Offshore Areas identified areas of elevated concentrations as occurring within a 1,000-foot area bordering the shoreline of the peninsula starting at the mouth of the Turning Basin, within the Turning Basin itself, and extending west and north to the graving dock area. Previous studies also identified the highest sediment chemical concentrations within the mouth of the Turning Basin and west of the Coke Oven area. Fish and crab tissues were collected in these areas due to the high concentrations of COCs detected in surface sediments. Tissue was also collected from a background area directly northwest of Sollers Point within the Patapsco River (**Figure 3**). This area was included in the background area evaluated in previous studies.

Initial target species were blue crab (*Callinectes sapidus)* and channel catfish (*Ictalurus punctatus*) (**Table 1**). Although channel catfish were the preferred target species, because they are bottom-feeders, salinities observed in Baltimore Harbor at the time of sampling were higher than the expected tolerance for channel catfish; therefore, white perch was the prevalent species collected for site-specific field study.

For the white perch, filets and whole body composites were tested. Filet composites consisted of filets from one side of the fish. The filets from the other side were frozen and archived individually for future confirmatory analysis, if needed; half of the whole fish was also retained and archived, if the sample volume requirements allowed. Both meat and hepatopancreas (mustard) samples were collected from blue crab. Both filet and whole body fish tissue were analyzed because humans are expected to consume mostly filets, and wildlife are expected to consume whole body fish. For the blue crab, both crab meat and mustard (hepatopancreas) were analyzed because humans may consume both, and chemical concentrations in mustard are expected to be higher than those in meat.

Each composite was composed of tissue from a minimum target number of three individual organisms (a total of 172 individual organisms were caught, 66 fish and 106 crabs). Individual organisms were of a size standard (legal size) suitable for consumption according to Maryland State regulations for recreational fishing. Size standards for each of the species discussed above are:

- **White perch**: Target length = 5 inches or longer. There is no state size limit for recreational hook and line capture; size limit is greater than 8 inches for other gear. Fish greater than 5 inches were targeted. Samplers used hook and line techniques.

- **Blue crab**: 5.25 inches or wider (carapace width). The state limit for male crabs collected between July 15 and December 15 is 5.25 inches; limits for male crabs

collected between April 1 and July 14 is 5 inches. The larger size was selected based on time of year collection occurred.

Five composite samples were created for each tissue type for each species at each location, for a total of 40 composite samples (**Table 1**); 10 fish (5 fillets and 5 whole body) and 10 crab (5 meat and 5 mustard) from each of the Coke Point Offshore Area and Patapsco River Background Area. Tissue samples were analyzed for metals, PAHs, PCBs, and arsenic speciation as well as lipid content. Screening in preparation for this study identified these chemicals as those most likely to bioaccumulate. Arsenic speciation was included because site-specific information would aid in refining assessment results. Dioxins, VOCs, inorganics (cyanide) and organotins compounds were detected in Coke Point Offshore Area sediments but were not included in site-specific field collection of tissue. As discussed above, they were not because initial screening indicated that these chemicals were less likely to accumulate to levels of concern than metals, PAHs, and PCBs.

3.2 SAMPLING NARRATIVE

Crabs were captured using trot lines. Fish were captured using hook and line. Collection occurred on September 21st, 23rd, 24th, 29th and October 5th 2010, before the blue crab migration from the upper Chesapeake Bay. EA obtained the scientific collection permit and reported fish collection information back to the Maryland Department of Natural Resources (MDNR), as required by the permit conditions. The permit is included as part of the work plan (**Attachment A**).

3.2.1.1 Individual Specimen Log-In and Labeling

For each fish captured, the specimen capture location, capture method, collection personnel, species, mass and length were recorded using the appropriate field data sheets (**Attachments A and B**). Specimens of target species that met the size requirements discussed above were placed in individual plastic bags and labeled for later compositing. Others specimens were returned to the water.

For target species fish, individual specimens were placed in plastic bags and frozen at the end of each field day. For crabs, individuals were retained in bushel baskets separated by collected area, frozen, and bagged at the end of each day. A waterproof label was placed in each bag or affixed to individual crabs containing the following information: specimen name, site of collection, species, and specimen number; specimen collection date and time; sample crew member initials; and project name and number. The individual specimen identifier was also recorded on the field data form (**Attachment C**). Individuals were held until a sufficient number were obtained to prepare composite samples.

3.2.1.2 Composite Preparation, Labeling, and Preservation

Compositing was performed on October 1 and October 5 2010. Composites were assembled using fish or crabs of similar weights. Individuals were selected for use in a composite such that the size of each individual was within 75% of the size of all other individuals within that composite, per the following equation:

$$\frac{Minimum\ Size}{Maximum\ Size} \times 100 = _____ \geq 75\%$$

Three organisms were targeted for use in each tissue composite; for the blue crab samples it was necessary to use more than three individuals for a composite to achieve the 50 grams of meat and mustard mass required for analysis. Sample preparation was conducted in accordance with the work plan and *EPA Guidance for Assessing Chemical Contamination Data for Use in Fish Advisories Volume 1 Fish Sampling and Analysis – Third Edition* (USEPA 2000b).

The make-up of each composite sample was recorded on the appropriate data sheet in **Attachment C** along with the information above. Each composite sample was labeled with the following: sample name, site of collection, species, tissue type, and composite letter identifier; composite preparation date and time; sample preparer initials; and project name and number.

The same information was recorded on the sample label. Individual specimens were placed in a single labeled plastic bag per composite for shipment to the lab.). Fish tissue was submitted to the laboratory as whole frozen fish and fish were fileted by the analytical laboratory. If necessary, the fish were allowed to thaw to just above freezing to facilitate fileting. Filets included the fish skin (USEPA 2000b). Whole body fish composites consisted of the whole fish, including scales.

Crabs were steamed to facilitate separation of meat and mustard from shell; in some cases, mustard was removed from frozen crabs and steamed separately in the sample container. Meat and "mustard" samples were collected from blue crab by hand; care was taken to maintain meat and mustard as separate tissues. Meat and mustard composites for crabs required more than three individuals per composite, and depended on the mass required for analysis. Crab tissues were placed in glass jars on ice for shipment to keep samples at -20°C or cooler. Quality control samples, including matrix spikes, standard reference materials, and lab duplicates, were also prepared and analyzed in accordance with the work plan (**Attachment A**).

Processing equipment that came into direct contact with tissue during fileting and sample preparation was decontaminated in accordance with the work plan (**Attachment A**) to minimize cross-contamination. This included knives and bowls used in tissue processing.

3.2.1.3 Analytical Testing

Tissue samples were analyzed for lipids, metals, PCBs, and PAHs. Two of the five composite samples for each species from each location (site and background) were submitted for arsenic speciation (**Table 1**). Analytical testing of tissue was conducted by Test America in Pittsburgh, Pennsylvania and Brooks Rand Laboratories in Seattle, Washington (arsenic speciation). Prepared crabmeat and mustard were submitted to the laboratory in glass jars at temperatures at or below -20°C. Standard Reference Materials (SRMs) were obtained from the National Institute of Standards and Technology (NIST) or a comparable source, if available, and analyzed with each batch of samples.

3.2.1.4 Data Analysis

Analytical data were validated by EDS following procedures developed by USEPA. Data were reviewed to identify which chemicals were detected in each tissue type. Data were used to prepare descriptive summary statistics, including the maximum detected value and 95% UCLM for each tissue type. The 95% UCLM was calculated using the student *t*-statistic as

$$95\%\ \text{UCLM} = \bar{x} + t_{[.95,n-1]} \frac{s_x}{\sqrt{n}}$$

where

$\bar{x}$	= sample mean of concentration data
s_x	= sample standard deviation of concentration data
n	= number of sample replicates.
$t_{[.95,n-1]}$	= 95% percentile of the *t*-distribution with *n-1* degrees of freedom

In cases where sample size was too limited to derive a 95% UCLM, the maximum detected concentration was used. For non-detected concentrations, half of the reporting limit was utilized. Data were also used to perform statistical comparisons between sites. Statistical comparisons were made between results for the Coke Point Offshore Area and the Patapsco River Background Area. Nonparametric comparisons were performed using both the Quantile test and the Wilcox rank-sum test at the 95% significance level in order to test for differences in both the upper tails and the central tendency of the sample data sets.

To determine the total concentration of a chemical within the edible portion of the crab, the following equation was used:

$$\boxed{C_{EdCrab} = \frac{C_{Mustard} * M_{Mustard} + C_{Meat} * M_{Meat}}{M_{EdCrab}}}$$

where:

C_{EdCrab}	=	Concentration of chemical in the edible portion of the crab [milligrams per kilogram (mg/kg) wet weight];
$C_{Mustard}$	=	Concentration of chemical in crab mustard (mg/kg wet weight);
C_{Meat}	=	Concentration of chemical in crab meat (mg/kg wet weight);
$M_{Mustard}$	=	Weight of mustard per individual crab [grams (g) wet weight];
M_{Meat}	=	Weight of meat per individual crab (g wet weight); and
M_{EdCrab}	=	Summed weight of the meat and mustard from individual crab (g wet weight).

The ratio of meat to mustard in the crab by mass was assumed to be 4.36:1 based on information from the literature (Weidou 1981).

4.0 RESULTS

4.1 LABORATORY BIOACCUMULATION STUDIES

Sediment, clam tissue, and worm tissue collected from laboratory bioaccumulation tests were analyzed for metals, PAHs, and PCBs. The validated results for these chemical suites are presented in **Tables 4 through 9**, and laboratory analytical reports are included in **Attachment D**. **Table 4** details the results of chemical analyses completed on the sediment composites used to run the bioaccumulation tests. **Tables 5 through 8** present the tissue concentrations of clam and worm exposed to Coke Point and Patapsco River Background sediments. They also show the pre-test concentrations (concentrations in tissue prior to initiation of bioaccumulation exposures) of chemicals found in the clam and worm test organisms. **Table 9** displays the results of the laboratory clam and worm control tests using native/natural sediment.

4.1.1.1 Summary of Sediment Composite Data

Review of the chemical concentrations presented in **Table 4** indicate that the concentrations detected in the Coke Point Offshore Area sediment composite were similar to those targeted based on target values presented in **Table 2**. In general, concentrations in the Coke Point Offshore Area sediment composite were elevated above those in the composite from the Patapsco River background Area.

It is important to note that chromium speciation result for the sediment composite from the Coke Point Offshore Area was rejected during data validation due to poor spike recovery in laboratory quality assurance analyses (**Table 4**). This occurs when the sediment binds a chemical tightly and analyses cannot detect its concentration fully, and is a function of the type of sediment. Chromium speciation results from the Patapsco River Background Area indicated that over 96% of the chromium present in background sediment was trivalent. Based on this result, it is reasonable to assume that the Coke Point Offshore Area has similar conditions, and therefore the results for the trivalent chromium analysis were used in this assessment.

Grain size and organic carbon content of composited sediments were also considered to allow informed interpretation of bioaccumulation test results. The Coke Point Offshore Area composite (CP-SED-COMP) was composed of 30% sediment from BH-SED-03C and 70% sediment from SP09-03-00-10A by volume. Sample BH-SED-03C contained 53.1% silt, 42.4% sand, with the remainder composed of clay and gravel. Sample SP09-03-00-10A contained 83.2% silt, 13.1% sand, with the remainder composed of clay. The composite contained 8.82% organic carbon. The Patapsco River Background Area sediment composite (PR-SED-COMP) was prepared using sediment from sample EH3-00-10, which was composed of 98% sand and less than 2% silt and clay sized particles. It contained 0.293% organic carbon. This information indicates that background sediments used in laboratory bioaccumulation tests contain less fine grained material and organic carbon than Coke Point sediments. Fine grained and organic materials have a greater tendency to bind chemicals due to their higher surface area. This tends to increase concentrations in sediment, but, dependent on the type of chemical and particle composition, may decrease chemical bioavailability. Bioaccumulation results from each composite are most directly applicable to sediments containing similar chemical concentrations, grain size, and organic carbon content.

4.1.1.2 Summary of Laboratory Bioaccumulation Tissue Data

Summary statistics for clam and worm tissue, including the 95% UCLM, are presented in **Tables 11 and 12**. For tissue from tests using Coke Point Offshore Area, a total of 16 metals, 14 PAHs, and 15 PCB congeners were detected in clam, and 18 metals, 18 PAHs, and 10 PCBs were detected in worms. For Patapsco River Background Area, a total of 17 metals, no PAHs, and no PCB congeners were detected in clam, and 18 metals, no PAHs, and 2 PCBs were detected in worms.

A summary of arsenic speciation data is presented in **Table 10**. The percent of inorganic arsenic in test organisms ranged from 0.8% to 20.4%. The percentage of lipids detected in tissue is relatively consistent in clam and worm tissues between Coke Point Offshore Area tests and Patapsco River Background Area tests; lipid fractions for test organisms were low (between 0.29% and 1.1%).

4.1.1.3 Statistical Comparisons

Statistical comparisons between the Coke Point Offshore Area clam and worm tissue samples and the Patapsco River Background Area samples are presented in **Tables 11, 12,** and **16** through **19**. The tables report the site-wide minimum, maximum, and mean values for metals, PAHs, and PCBs. Nonparametric Quantile and Wilcox rank-sum tests were performed to indicate significant differences between the Coke Point Offshore Area, the Patapsco River Background Area, and pre-test tissue. All tests were conducted at the 95% significance level.

Tissue concentrations at the end of testing were compared to pre-test tissue concentrations in **Tables 16** through 1**9**. Clam and worm tissue exposed to Coke Point Offshore Area sediment demonstrate concentrations of numerous metals, PAHs, and PCBs that were statistically significantly higher than pre-test concentrations. This is a strong indication that uptake and bioaccumulation is occurring in organisms exposed to Coke Point sediment. For the Patapsco River Background Area samples, a different trend was observed. Few chemicals were found in tissue at concentrations that were statistically significantly higher than pre-test. This indicated that very little uptake or bioaccumulation occurred from the background sediments.

The following chemicals showed statistically higher concentrations in clams exposed to Coke Point Offshore Area sediments when compared to those in clams from Patapsco River Background tests (**Table 11**) (*= statistically exceeds pretest concentrations):

Chemicals Statistically Significantly Higher in Coke Point Clam Tissue

- Antimony*
- Arsenic
- Cobalt*
- Iron*
- Lead*
- Manganese*
- Selenium*
- Tin*
- Anthracene*
- Benzo(a)anthracene*
- Benzo(k)fluoranthene*
- Chrysene*
- Fluoranthene*
- Ideno(1,2,3-CD)pyrene*
- Phenanthrene*
- Pyrene*
- Total HMW PAHs (ND=0 and ND=DL)*
- Total LMW PAHs (ND=0 and ND=DL)*
- 12 PCB Congeners(87,101,105,118,126,128, 138,153,156,170, 180, 187)*
- Total PCBs (ND=0 and ND=DL)*

Chemicals denoted by an asterisk were also statistically significantly higher in Coke Point post-test tissues than in pre-test tissues. The following chemicals showed statistically higher concentrations in worms exposed to Coke Point Offshore Area sediments when compared to those in worms from Patapsco River Background tests (**Table 12**) (*= statistically exceeds pretest concentrations):

Chemicals Statistically Significantly Higher in Coke Point Worm Tissue

- Aluminum
- Antimony*
- Cobalt*
- Copper*
- Iron
- Lead
- Manganese
- Nickel
- Silver
- Tin*
- Acenapthene*
- Acenaphthylene*
- Anthracene*
- Benzo(a)anthracene*
- Benzo(a)pyrene*
- Benzo(k)fuoranthene*
- Benzo(b)fluoranthene*
- Chrysene*
- Dibenzo(a,h)anthracene
- Fluoranthene*
- Indeno(1,2,3-CD)pyrene*
- Naphthalene*
- Phenanthrene*
- Pyrene*
- Total HMW PAHs (ND=0 and ND=DL)*
- Total LMW PAHs (ND=0 and ND=DL)*
- 9 PCB Congeners (18, 28, 44, 52, 101, 138, 153, 180)*
- Total PCBs (ND=0 and ND=DL)*

It is important to note that there are a number of other chemicals for which comparisons are not identified as statistically significant but which were detected only in Coke Point Offshore Area tissues and not in Patapsco River Background Area tissues. This includes several metals, PAHs, and PCBs. While statistics did not indicate significance due to the influence of reporting limits, the fact that these chemicals were not detected in background tissue indicates that Coke Point bioaccumulation may be greater.

These results indicate that chemicals in Coke Point sediments are bioavailable and taken up into benthic organism tissue, and that concentrations of metals, PAHs, and PCBs in tissues exposed to sediment from the Coke Point Offshore Areas accumulate to levels higher than those in organisms exposed to background area sediments.

4.1.1.4 Bioaccumulation Factor (BAF) Development and Application to Food Web Models

BAFs relate the concentration of chemicals in tissue to concentrations in sediment. Site-specific BAFs can be developed from laboratory bioaccumulation data and applied to site-specific sediment concentrations in food web models to derive estimates of human and wildlife exposures. To derive BAFs, the concentration detected in each tissue sample was divided by the concentration in sediment used to perform the bioaccumulation tests. For each tissue type, BAFs were statistically analyzed to determine the 95% UCLM BAF for each chemical. BAFs based on clam and worm data are presented in **Tables 17** and **18**. Most BAFs for metals were less than 1% on a dry weight sediment to wet weight tissue basis. A few metals had BAFs between 1% and 6%. BAFs for PAHs and PCBs were higher, with several PAHs and PCBs having BAFs in the range of 10% to 35% or more. The percent of inorganic arsenic ranged from 7% to 38% in the Coke Point Offshore Area and 7% to 34% in the Patapsco River Background Area.

There are several factors that should be considered when applying BAFs which are relevant to data from this study. Laboratory bioaccumulation tests provide a strong indicator of whether a chemical source in sediment can lead to elevated concentrations in tissue. This is because organisms in laboratory bioaccumulation tests are exposed directly to sediments under controlled conditions, providing certainty as to where and when exposures occurred. Laboratory bioaccumulation tests are also good indicators of lower trophic level exposures because of the organisms used, which are representative of a range of benthos.

BAFs vary based on the concentration of chemical in sediment. Therefore, sediment composites were selected specifically to approximate the 95% UCLM, as discussed in Section 2.1 above. Only one composite sediment sample from each area (Coke Point and background) was used to conduct bioaccumulation tests.

Another factor to be considered is the fact that relatively uncontaminated sediments may produce extremely high BAFs that are not comparable to actual conditions due to a data artifact. This is especially true for metals. This can occur when a chemical is detected at very low concentrations in both sediment and tissues. At low levels, small variations in the accuracy of lab measurements can cause big differences in the concentrations reported. Because many metals are naturally found in tissues, lab variation can often generate unusually large BAFs for clean sediments that are not reflective of actual uptake relationships. Therefore, it is most appropriate to utilize the BAFs derived from Coke Point bioaccumulation exposures rather than those from background bioaccumulation exposures in estimating wildlife exposure through the food web models for both Coke Point and the background areas as these are more likely to represent actual uptake scenarios. Also, as discussed in Section 4.1.1.1 above, grain size differed between the Coke Point Offshore Area composite and the Patapsco River Background Area composite. Grain size in the Patapsco River Background Area is representative of background samples EH2-00-10, EH-3-00-10, and EH-4-00-10, but is not representative of grain size in background sample BKGD-SED-01, -02, or -03 where most organic chemicals were detected.

These samples contained a higher percentage of fines, more similar to the grain size at Coke Point. Therefore, BAFs derived from the Coke Point Offshore Area are more likely to be representative of exposures at these locations.

4.2 FIELD –COLLECTED FISH AND CRAB TISSUE

Metals, PAHs, and PCBs were detected in tissues collected from both the Coke Point Offshore and Patapsco River Background Areas. Results from each fish and crab tissue composite sample are presented in **Tables 19 through 22**. The tables report the validated results for concentrations of metals, PAHs, and PCBs. Laboratory analytical reports are included in **Attachment D**. It should be noted that results for PAHs from one sample of crab mustard (CASA-MU-A) were rejected during data validation. Results were rejected because recovery of a surrogate chemical during laboratory quality assurance tests was too low for acceptance. This is a common occurrence in analysis of lipid-rich tissues such as crab mustard, which tend to absorb chemicals and make them difficult to detect.

4.2.1.1 Summary of Field-Collected Tissue Data

Summary statistics, including the 95% UCLM, are included in **Tables 23** through **27**. Metals, PAHs, and PCBs were detected in each tissue type collected and concentrations were generally higher in fish whole body samples than in fish filets, and in crab mustard than in crab meat

A summary of arsenic speciation data is presented in **Table 10**. The percent of inorganic arsenic in test organisms ranged from 7.4 to 19.0% for fish filet, crab meat and crab mustard, and from 34.3 to 38.4% in whole body fish. The average inorganic arsenic concentration for field collected fish filets, crab meat, and crab mustard is 10.4%. This provides a value considered representative of the percentage inorganic arsenic that may be expected in tissues consumed by humans.

The percentage of lipid detected in tissue is varied between tissue types **(Tables 23** through **27)**. Lipids were highest in crab mustard (3.0 to 9.8%) and whole body fish (2.6 to 5.8%), while they were lower in crab meat (0.77 to 2.3%), edible crab (1.2 to 2.6%) and fish filet (0.8 to 5.0%). Tissue lipid fractions were similar in samples from both study areas, with the exception of fish filets.

4.2.1.2 Statistical Comparisons

Statistical comparisons between the Coke Point Offshore Area fish and crab tissue samples and the Patapsco River Background Area samples are presented in **Tables 23** through **24**. The tables report the site-wide minimum, maximum, and mean values for metals, PAHs, and PCBs.

Nonparametric Quantile and Wilcox rank-sum tests were was performed to indicate significant differences between the Coke Point Offshore Area, the Patapsco River Background Area, and pre-test tissue. All tests were conducted at the 95% significance level.

4.2.1.3 Crab Tissue

Concentrations of chemicals in crab tissue from the Coke Point Offshore Area were statistically significantly higher than those in the background area for a number of the following constituents:

Chemicals Statistically Significantly Higher in Coke Point Crab Tissue

Crab Meat
- Arsenic
- Cobalt
- Iron
- Lead
- Manganese
- Nickel
- Benzo(b)fluoranthene
- Fluoranthene
- Pyrene

Crab Mustard
- Aluminum
- Antimony
- Chromium
- Copper
- Iron
- Lead
- Silver
- Benzo(B)fluoranthene
- Fluoranthene
- Naphthalene
- Pyrene
- Total HMW PAHs (ND=0)
- 2 PCB Congeners (206 and 209)

Edible Crab
- Iron
- Lead
- Fluoranthene
- Total HMW PAHs (ND=DL)

In addition to these chemicals, there were several PAHs and PCBs that were detected in Coke Point Offshore Area crab tissue but were not detected in background tissue; while evaluation did not indicate this difference as statistically significant, it may indicate a trend. Patapsco River Background Area crab tissue concentrations of a few PCB congeners were higher than those for the Coke Point Offshore Area at concentrations that are statistically significant.

4.2.1.4 Fish Tissue

Concentrations of chemicals in fish tissue from the Coke Point Offshore Area were statistically significantly higher than those in the background area for the following chemicals:

Chemicals Statistically Significantly Higher in Coke Point Fish Tissue

Whole Body Fish
- Antimony
- Copper
- Iron
- Lead
- Selenium
- Silver
- Zinc
- Fluoranthene
- Total LMW PAHs (ND=0 and ND=DL)
- 11 PCB Congeners (101, 105, 118, 138, 153, 156, 170, 183, 195, 206, 209)

Fish Filet
- Aluminum
- Lead
- Manganese

- Total PCBs (ND=0 and ND=DL)

In addition to these chemicals, there were a few PAHs detected in Coke Point Offshore Area whole body fish tissue but were not detected in background tissue; while evaluation did not indicate this difference as statistically significant, it may indicate a trend.

Chromium in fish filets from the Patapsco River Background Area was higher than that in the filets from the Coke Point Offshore Area. Fish filets from the Patapsco River Background Area contained higher overall concentrations of many PCBs, arsenic, and selenium than filets from the Coke Point Offshore Area. There are a number of reasons concentrations could be higher in background area filets; it should be noted that the lipid fraction of background area filets were statistically significantly higher than that of filets from the Coke Point Offshore Area.

4.2.1.5 Tissue 95% UCLM Development and Application in Food Web Models

Benthic organisms, such as clams and worms, may be exposed to concentrations at a single location or limited geographic range for most of their life span. However, most fish, crustaceans, wildlife, and humans are likely to move throughout the offshore area, and may be exposed to sediment or surface water at many locations over time. Therefore, tissue 95% UCLM for crab and fish were developed (as discussed in Section 3.7) as reasonable maximum exposure estimates. These concentrations are presented in **Tables 20 through 24**. It is important to note that use of field collected tissue is less reliable than use of BAFs calculated using laboratory bioaccumulation methods for linking exposure to chemical concentrations in sediment to concentrations accumulated in tissue because field collected organisms are highly mobile.

5.0 DISCUSSION

Laboratory bioaccumulation tests were designed to provide an environment in which uptake from sediment into aquatic organisms (clams and worms) can be measured directly. This provides the best indication of whether chemicals in Coke Point offshore sediments are bioavailable because the test evaluates exposures of the lower trophic level. These species are directly representative of the kinds of organisms that wildlife, fish, and crabs consume routinely. They indirectly represent bottom-dwelling species that humans are more likely to consume such as crabs, assuming that such organisms spend large amounts of time around Coke Point. It also provides the best indication of whether offshore sediments contribute chemicals to aquatic organism tissues that may cause exposures. Laboratory bioaccumulation studies indicate that metals, PAHs, and PCBs were bioavailable, as evidence by uptake into clam and worm tissues compared to pre-test tissues. Statistical comparisons also show that concentrations of 9 metals, 12 PAHs, and 9 PCB congeners were statistically significantly higher in tissue exposed to Coke Point sediment than in tissue exposed to background sediments. This is a strong indication that the Coke Point Offshore Area may contribute increased levels of chemicals to the aquatic food chain compared to other nearby areas of the Patapsco River.

Based on this information, bioaccumulation estimates based on laboratory tissue results are most directly applicable to ecological exposures, but also bear relevance to human exposures as a worst case scenario. The 95% UCLM BAFs developed from Coke Point laboratory

bioaccumulation results are recommended for use in estimating bioaccumulation for both Coke Point and background exposures. The higher of the BAFs values from clams or worms provides a suitably protective measure of bioaccumulation.

Field collected tissue samples provided a more accurate characterization of the exposure for wildlife and humans consuming game fish and crabs in the area. These results provided information for evaluating the Coke Point Offshore Area. The test species (white perch and crab) are common game species in the area. These species are directly representative of the kinds of organisms that humans and larger wildlife may consume. Based on this information, bioaccumulation estimates based on field- collected tissue are most directly applicable to human exposures, but also bear relevance to ecological exposures. However, field-collected tissue provides a less reliable assessment of the potential exposure contributed from sediment and surface water conditions in each area since the crabs and fish have seasonal migration and foraging ranges that may extend beyond the areas of interest.

Analysis of field- collected tissue indicated that metals, PAHs, and PCBs are present in whole body fish and crab tissues. Statistical comparisons show that concentrations of metals, PAHs, and some PCB congeners were statistically significantly higher in crab mustard from the Coke Point Offshore Area compared to mustard from the background area. Metals and PAHs were higher in total edible crab tissue from the Coke Point Offshore area than in background tissue, and only metals were statistically significantly higher in Coke Point Offshore Area fish tissue compared to background tissue. This is a strong indication that the Coke Point Offshore Area may contribute increased levels of chemicals to game species in the aquatic food chain compared to other nearby areas of the Patapsco River. However, it should also be noted that concentrations of PCB congeners, arsenic, and selenium were higher in fish filets collected from the Patapsco River Background Area than from the Coke Point Offshore area; this may be due in part to differences in lipid content.

Development of a BAF is not appropriate from a single sampling of field specimens given that their residency at the site is uncertain. Therefore, the 95% UCLM concentration in each tissue from each area (Coke Point and background) is recommended as a precautionary representation of site-wide exposure for use in evaluation of Coke Point Offshore Area. Ingestion of whole body fish tissue is most appropriate for wildlife exposures, while ingestion of fish filet is most appropriate for human exposures. Ingestion of total edible crab is appropriate for both wildlife and humans.

6.0 CONCLUSION

The laboratory bioaccumulation tests performed as part of the study provide strong evidence that metals, PAHs, and PCBs in Coke Point sediments are available for uptake. Statistical comparisons using laboratory bioaccumulation test tissue data indicate that metals, PAHs, and PCBS are all bioaccumulated in greater amounts from Coke Point sediments than from sediments in a nearby background area in the Patapsco River. This indicates that the Coke Point Offshore Area causes a higher level of exposure than surrounding areas and contributes these chemicals to the local food chain. Comparisons based on field study results indicate the same general trend for crab tissue and whole body fish tissue, with the exception of PCBs in fish filets. Study results indicate that more chemicals are accumulated at higher concentrations in lower

trophic level organisms than in crabs and fish, and that higher concentrations are accumulated in crabs and whole body fish than in fish filets. This bioaccumulation study provides sediment BAFs for use in estimating benthic organism uptake from sediments, and 95% UCLM crab and fish tissue concentrations as estimates of reasonable maximum exposures.

7.0 REFERENCES

EA Engineering, Science, and Technology, Inc. (EA). 2009. *Site Assessment for the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point*. Final. November.

EA. 2006. EA Ecotoxicology Laboratory Quality Assurance and Standard Operating Procedures Manual. EA Manual ATS-102. Internal document prepared by EA's Ecotoxicology Laboratory, EA Engineering, Science, and Technology, Inc., Sparks, Maryland.

EA Engineering, Science, and Technology, Inc. (EA). 2004. *Feasibility Studies of Sparrows Point as a Containment Site for Placement of Harbor Dredged Material: Environmental Conditions.*

New Jersey Department of Environmental Protection. Division of Science, Research, and Technology. 2005. *Estimate of Cancer Risk to Consumers of Crabs Caught in the Area of the Diamond Alkali Site and Other Areas of the Newark Bay Complex from 2,3,7,8-TCDD and 2,3,7,8-TCDD Equivalents*. April.

Weidou, M.A. 1981. Distribution and Binding of Cadmium in the Blue Crab, Implication in Human Health. Doctoral Dissertation, New York University. Institute of Environmental Medicine.

U.S. Environmental Protection Agency (USEPA). 2000a. Mid-Atlantic Regional Implementation Manual: Dredged Material Evaluation for Norfolk and Dam Neck Ocean Disposal Sites. USEPA-Region 3.

U.S. Environmental Protection Agency (USEPA). 2000b. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1 Fish Sampling and Analysis Third Edition.* EPA 823-B-00-007. November.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE). 1998. *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual (ITM).* EPA-823-B-98-004.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE). 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal.* EPA-503/8-91/001. "The Green Book."

U.S. Environmental Protection Agency (USEPA). 1992. *Guidelines for Data Usability in Risk Assessment (Part A)*. Office of Solid Waste and Emergency Response, Publication OSWER9285.7-09A.

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FIGURES

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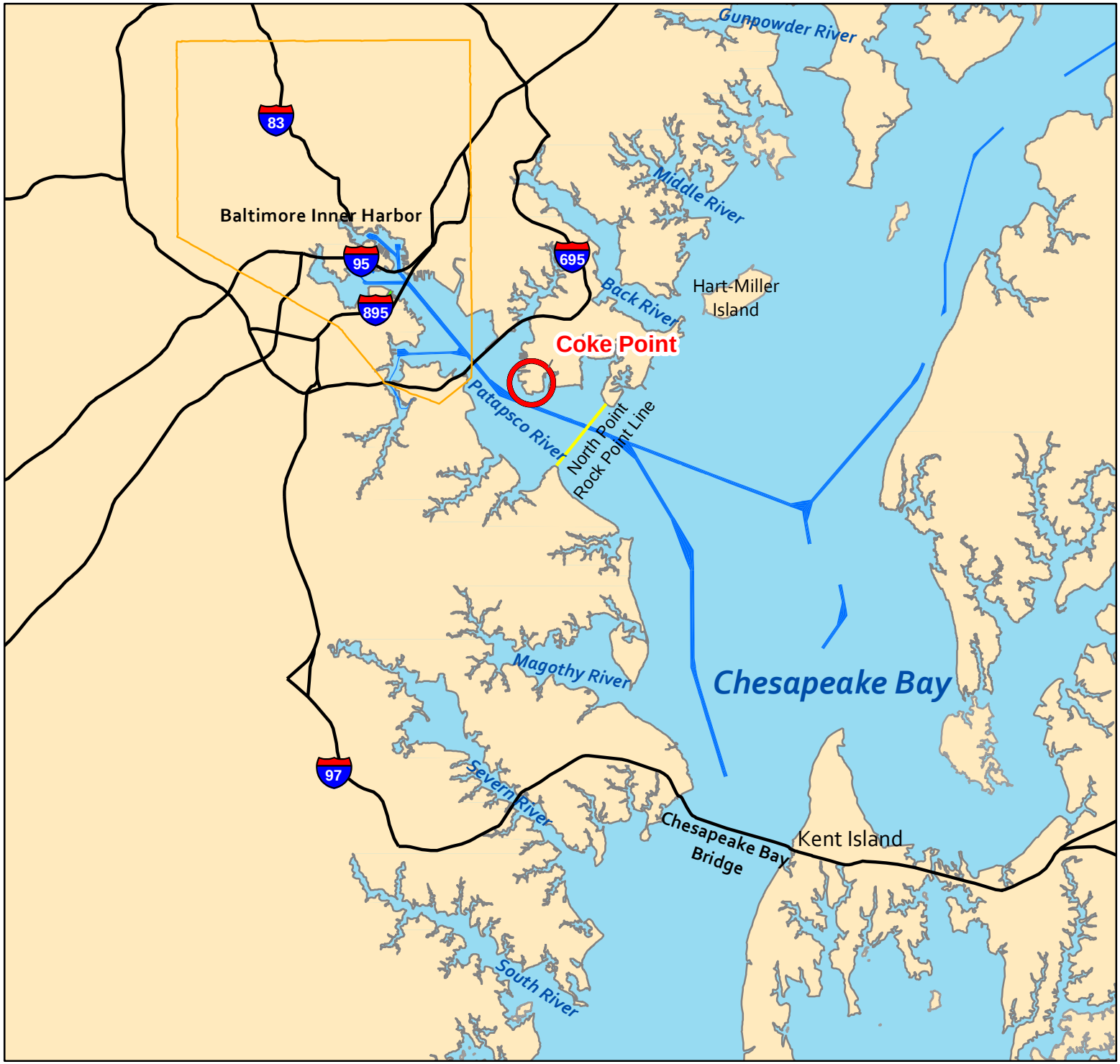

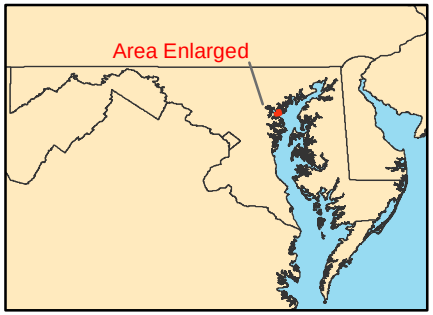

Legend

- Federal Navigation Channels
- Roads
- Baltimore City

Miles

0 4 8

Figure 1
Coke Point Location

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Legend

Areas of Concern

Feet

0 750 1,500

Figure 2
Coke Point
Areas of Concern

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Study Areas

Feet

0 1,800 3,600

Figure 3
Proposed Fish and Crab Tissue Sampling Locations

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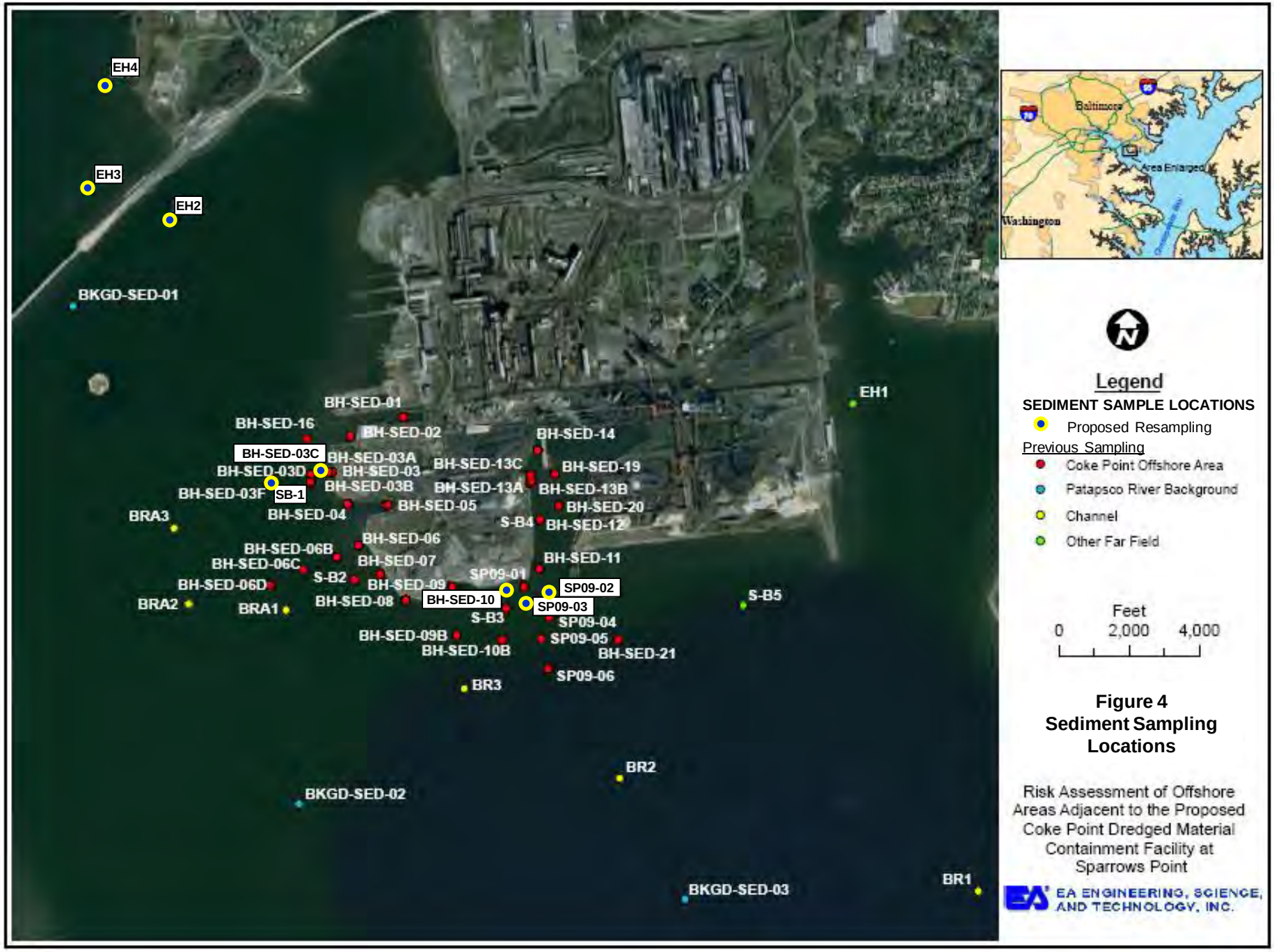

Figure 4
Sediment Sampling Locations

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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TABLES

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Table 1. Study Design: Number of Composite Samples for Analytical Testing

Matrix		Metals	PAHs	PCBs	Arsenic Speciation	Hexavalent Chromium	Lipids
FIELD STUDIES							
Coke Point Offshore Area							
Fish Composite	Whole body	5	5	5	2	0	5
	Filet	5	5	5	2	0	5
Crab Composite	Meat	5	5	5	2	0	5
	Mustard	5	5*	5	2	0	5
Patapsco River background area							
Fish Composite	Whole body	5	5*	5	2	0	5
	Filet	5	5	5	2	0	5
Crab Composite	Meat	5	5	5	2	0	5
	Mustard	5	5	5	2	0	5
Field Total Samples		40	40	40	16	0	40
LABORATORY STUDIES							
Coke Point Offshore Area							
Sediment grab samples		5	5	5	0	0	0
Sediment composite		1	1	1	0	1	0
Clam		5	5	5	2	0	5
Worm		5	5	5	2	0	5
Patapsco River background area							
Sediment grab samples		3	3	3	0	0	0
Sediment composite		1	1	1	0	1	0
Clam		5	5	5	2	0	5
Worm		5	5	5	2	0	5
Control Samples (lab control and pre-test)							
Control Sediment		1	1	1	0	0	0
Clam		6	6	6	2	0	6
Worm		6	6	6	2	0	6
Lab Total Samples		43	43	43	12	2	32
Overall Total		83	83	83	28	2	72

* Some PAH values in CP-CASA-MU-A and PR-MOAM-WB-A composites were rejected due to low surrogate recovery.

Table 2
Highest Detected Chemical Concentrations for Target Analytes in Previously Collected Samples

SAMPLE	ARSENIC	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	ZINC	BENZO(A)PYRENE	DIBENZO(A,H) - ANTHRACENE	HMW PAHS	LMW PAHS	NAPHTHALENE	TOTAL PCBS
Target	**27.6**	**236**	**29.4**	**172**	**76400**	**351**	**1270**	**999**	**12.5**	**2.46**	**86.5**	**2200**	**2150**	**0.265**
BH-SED-01	17.2	249	--	139	--	175	--	861	1.1	0.19	7.28	6.933	3.7	--
BH-SED-02	4.5	105	--	50.1	--	68.4	--	373	9.3	1.3	61.6	142.3	85	0.055
BH-SED-03A	9.8	120	--	44.5	--	65.8	--	279	5.3	0.13	32.1	109.6	90	--
BH-SED-03B	25.2	296	--	177	--	373	--	1070	9.9	0.9	73.9	7280	7200	0.097
BH-SED-03C	***50.1***	***450***	--	***595***	--	***602***	--	***1790***	***10***	***1.9***	***69***	***237.7***	***190***	***0.274***
BH-SED-03F	44.3	504	27.2	307	86400	341	844	1160	4.3	0.65	26.35	10.76	5	0.283
BH-SED-04	21.4	376	--	81.7	--	216	--	838	6	0.89	35.39	122.6	97	0.065
BH-SED-05	9.4	138	--	51.7	--	70.6	--	418	26	0.13	267	190.3	50	--
BH-SED-06	19.2	180	--	97.3	--	166	--	498	26	6.3	214.3	115.3	20	0.096
BH-SED-06B	26.2	290	23.7	173	72000	231	869	777	3.6	0.57	22.07	11.56	6	0.12
BH-SED-06C	23.9	220	21.8	105	54100	160	865	518	4.4	0.6	27.7	8.549	2.5	0.079
BH-SED-06D	18.9	111	15.7	71	33500	101	675	329	1.9	0.2	9	3.285	0.79	0.028
BH-SED-07	22.9	261	--	87.7	--	208	--	617	56	4.3	288.3	206.7	14	--
BH-SED-08	20	283	--	129	--	171	--	597	8.8	1.5	57.8	37.64	12	--
BH-SED-09	12.5	156	--	60.4	--	146	--	619	25	4.9	143.9	63.16	13	--
BH-SED-09B	14.6	145	23.1	80.1	53000	132	1220	485	3.4	0.62	22.22	15.86	7.4	0.047
BH-SED-10	***46.8***	***200***	--	***130***	--	***1150***	--	***2730***	***15***	***2.6***	***104***	***59.97***	***9.9***	***0.017***
BH-SED-10B	14.6	144	26.5	81.7	61300	141	1310	525	2.5	0.54	17.54	11.97	5.2	0.03
BH-SED-11	34.1	235	--	275	--	567	--	1400	12	1.9	82.2	79.66	37	0.137
BH-SED-12	12.6	107	--	75.5	--	268	--	609	5.5	1	35.6	17.79	5.3	--
BH-SED-13A	7.8	178	--	30.9	--	87.2	--	150	3.6	0.53	26.33	41.64	16	--
BH-SED-13B	13.6	127	--	80.6	--	167	--	479	0.63	0.086	5.436	4.478	1.7	0.006
BH-SED-13C	14.8	124	--	87.7	--	169	--	495	0.32	0.3	3.36	2.309	0.77	--
BH-SED-14	13.3	137	--	89.6	--	166	--	511	0.73	0.12	6.6	5.7	1.5	--
BH-SED-19	15.9	117	26.4	84.4	58100	171	1590	593	0.46	0.21	3.58	2.898	0.91	0.038
BH-SED-20	17.1	118.5	27.95	79.4	58050	159.5	1440	519.5	1.155	0.34	8.185	5.228	1.9	0.033
BH-SED-21	14.1	114	26.5	68.4	51800	114	1220	410	0.32	0.14	2.47	1.98	0.76	0.036
SB-1	***42.5***	***391***	***25.6***	***305***	***91900***	***470***	***1590***	***1430***	***9.6***	***1.9***	***66.4***	***100.4***	***55***	***0.46***
SB-2	30.4	241	26.2	216	66000	197	990	628	2.1	0.36	12.56	5.786	1.8	0.176
SB-3	28.6	195	30.8	200	62000	300	1370	928	20	4.1	140.1	93.98	21	0.207
SB-4	14.6	93.1	20.2	79.8	44600	298	1160	668	6.5	1.9	40.1	20.18	4.4	0.081
SP09-01	8.2	42	13.5	27.4	28700	43	819	99.5	0.61	0.11	4.15	2.307	0.46	0
SP09-02	***72***	***262***	***25.5***	***193***	***1E+05***	***1280***	***1090***	***2250***	***27***	***4.6***	***216.6***	***242.3***	***52***	***0.155***
SP09-03	***52.2***	***362***	***53***	***431***	***1E+05***	***588***	***1520***	***1570***	***12***	***1.8***	***85.1***	***103.7***	***55***	***0.451***
SP09-04	31.6	192	27.8	157	88200	327	1090	936	5.5	0.88	35.08	17.39	3.4	0.446
SP09-05	17.6	146	27.6	82.2	70300	152	1160	478	1.9	0.37	12.07	7.91	3.4	0.098
SP09-06	22.2	159	27	82	58600	146	1260	498	1.9	0.26	11.81	5.745	1.3	0.119

Bold italicized sample names are those selected for discrete sediment sampling in this study.
Target = Target is the 95% UCLM derived using proUCL for sediment concentrations based on previous studies.
HMPAH= high molecular weight PAHs
LMPAH= low molecular weight PAHs

Table 3
Sediment Sample Coordinates*

Sample	X-coordinate	Y-coordinate
Coke Point Offshore Area		
BH-SED-03C-00-10A	1453539.000090	562223.300018
BH-SED-10-00-10A	1457597.800000	559612.000000
SB-1-00-10A	1453271.789990	561991.620035
SP09-02-00-10A	1458578.699980	559564.499889
SP09-03-00-10A	1458035.600020	559304.600146
Patapsco River Background Area		
EH2-00-10	1450130.859920	567745.870009
EH3-00-10	1448332.629920	568427.470024
EH4-00-10	1448679.310010	570716.590118

*Coordinate system is NAD 83 UTM feet.

TABLE 4
VALIDATED SEDIMENT COMPOSITE RESULTS FROM LABORATORY BIOACCUMLATION STUDIES
(Dry weight)

Analyte	Validated Sediment Composite Results			
	Units (dry weight)	Coke Point Offshore Area Sediment	Patapsco River Background Area Sediment	Lab Control Sediment
METALS				
ALUMINUM	mg/kg	12200	544	6010
ANTIMONY	mg/kg	1.4 J	0.072 J	0.031 L
ARSENIC	mg/kg	51.8	1.3	1.3
BERYLLIUM	mg/kg	1.2	0.063	0.094
CADMIUM	mg/kg	5	0.047 J	0.072
CHROMIUM, TOTAL	mg/kg	259	19.2	16.5
CHROMIUM, HEXAVALENT	mg/kg	0.49 U	0.64 L	0.49 U/R
COBALT	mg/kg	51.3	0.82	3.4
COPPER	mg/kg	376	4	5.8 L
IRON	mg/kg	90200	2190	10000
LEAD	mg/kg	814	5.9	1.1
MANGANESE	mg/kg	1360	69.2	119
MERCURY	mg/kg	1.6	0.014 J	0.02 U
NICKEL	mg/kg	39.6	1.6	22.6
SELENIUM	mg/kg	6.5	0.14 J	0.35
SILVER	mg/kg	2.2	0.033 J	0.014 J
THALLIUM	mg/kg	0.82	0.022 B	0.055 J
TIN	mg/kg	101 J	2.9 J	0.24 J
VANADIUM	mg/kg	NA	NA	NA
ZINC	mg/kg	1600	21.8	17.8
PAHS				
1-METHYLNAPHTHALENE	ug/kg	1400	21 U	8.2 U
2-METHYLNAPHTHALENE	ug/kg	2800	21 U	8.2 U
ACENAPHTHENE	ug/kg	2800	21 U	8.2 U
ACENAPHTHYLENE	ug/kg	5600	10 J	8.2 U
ANTHRACENE	ug/kg	12000	8.2 J	8.2 U
BENZO(A)ANTHRACENE	ug/kg	27000	12 J	8.2 U
BENZO(A)PYRENE	ug/kg	29000	12 J	8.2 U
BENZO(B)FLUORANTHENE	ug/kg	35000 J	16 J	8.2 U
BENZO(G,H,I)PERYLENE	ug/kg	15000	21 U	8.2 U
BENZO(K)FLUORANTHENE	ug/kg	390 UJ	21 UJ	8.2 U
CHRYSENE	ug/kg	26000	10 J	8.2 U
DIBENZO(A,H)ANTHRACENE	ug/kg	4900	21 U	8.2 U
FLUORANTHENE	ug/kg	59000	23	8.2 U
FLUORENE	ug/kg	2900	21 U	8.2 U
INDENO(1,2,3-CD)PYRENE	ug/kg	14000	21 U	8.2 U
NAPHTHALENE	ug/kg	83000	21	8.2 U
PHENANTHRENE	ug/kg	15000	12 J	8.2 U
PYRENE	ug/kg	31000	16 J	8.2 U
TOTAL HMW PAH (ND = 0)	ug/kg	181900	66	0
TOTAL HMW PAH (ND = DL)	ug/kg	182290	150	73.8

TABLE 4
VALIDATED SEDIMENT COMPOSITE RESULTS FROM LABORATORY BIOACCUMLATION STUDIES
(Dry weight)

Analyte	Validated Sediment Composite Results			
	Units (dry weight)	Coke Point Offshore Area Sediment	Patapsco River Background Area Sediment	Lab Control Sediment
TOTAL LMW PAH (ND = 0)	ug/kg	184500	74.2	0
TOTAL LMW PAH (ND = DL)	ug/kg	184500	158.2	73.8
PCBS				
PCB 8 (BZ)	ug/kg	19 J	0.47 J	0.2 UJ
PCB 18 (BZ)	ug/kg	20	0.21 U	0.2 UJ
PCB 28 (BZ)	ug/kg	26	0.32	0.2 UJ
PCB 44 (BZ)	ug/kg	21	0.16 B	0.2 UJ
PCB 49 (BZ)	ug/kg	10 J	0.25 J	0.2 UJ
PCB 52 (BZ)	ug/kg	26 B	0.31 B	0.2 UJ
PCB 66 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 77 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 87 (BZ)	ug/kg	10 J	0.18 J	0.2 UJ
PCB 90 (BZ)	ug/kg	2.9 J	0.21 U	0.2 UJ
PCB 101 (BZ)	ug/kg	1.6 U	0.22	0.2 UJ
PCB 105 (BZ)	ug/kg	4.8 J	0.15 J	0.2 UJ
PCB 118 (BZ)	ug/kg	14	0.14 J	0.2 UJ
PCB 126 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 128 (BZ)	ug/kg	8 J	0.057 J	0.2 UJ
PCB 138 (BZ)	ug/kg	15 J	0.33	0.2 UJ
PCB 153 (BZ)	ug/kg	21 J	0.24	0.2 UJ
PCB 156 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 169 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 170 (BZ)	ug/kg	6.6 J	0.21 U	0.2 UJ
PCB 180 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 183 (BZ)	ug/kg	0.43 J	0.21 U	0.2 UJ
PCB 184 (BZ)	ug/kg	1.6 U	0.21 U	0.2 UJ
PCB 187 (BZ)	ug/kg	7.2	0.21 U	0.2 UJ
PCB 195 (BZ)	ug/kg	3.3 J	0.21 U	0.2 UJ
PCB 206 (BZ)	ug/kg	8 J	0.21 U	0.2 UJ
PCB 209 (BZ)	ug/kg	8.4 J	0.16 J	0.2 UJ
TOTAL PCBS (ND = 0)	ug/kg	377.2	4.794	0
TOTAL PCBS (ND = DL)	ug/kg	396.4	8.154	7.2

U = Chemical was analyzed for, but not detected.
J = The value is an estimated quantity.
B = The analyte is found in the associated method blank as well as in the sample.
HMW= high molecular weight
LMW= low molecular weight
ND= non detect DL= detection limit
R = Data were rejected due to poor spike recovery.
Full suites of metals, PAHs, PCBs, and SVOCs in the sediment were analyzed. SVOCs, as they are not identified as chemicals of concern, are not presented in the table.

TABLE 5
VALIDATED RESULTS FROM COKE POINT LABORATORY BIOACCUMULATION STUDIES: CLAM TISSUE

Analyte	Chemical Type (Molecular Weight)	Clam Tissue Exposed to Coke Point Sediments (mg/kg wet wt.)										Pre-test Clam Tissue (mg/kg wet wt.)					
		Rep 1: AT0-649A		Rep 2: AT0-649B		Rep 3: AT0-649C		Rep 4: AT0-649D		Rep 5: AT0-649E		PRETEST-A		PRETEST-B		PRETEST-C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																	
PERCENT LIPIDS	--	3.50E-01		3.90E-01		3.60E-01		4.00E-01		4.10E-01		3.90E-01		3.00E-01		3.60E-01	
METALS																	
ALUMINUM	--	1.32E+01		1.39E+01		1.32E+01		1.25E+01		1.49E+01		1.02E+01		5.30E+00		4.60E+00	
ANTIMONY	--	4.80E-02	J	1.30E-02	J	3.80E-02	J	3.40E-02	J	2.10E-02	J	1.40E-02	J	1.20E-02	J	1.30E-02	J
ARSENIC	--	2.70E+00		2.10E+00		2.30E+00		2.50E+00		2.90E+00		3.00E+00		2.60E+00		2.80E+00	
Speciation (Inorganic As)	--	1.47E-01		1.37E-01		--		--		--		1.01E-01		9.30E-02		--	
Speciation (As III)	--	1.09E-01	L	1.01E-01	L	--		--		--		8.30E-02	L	7.20E-02	L	--	
Speciation (As V)	--	3.80E-02	L	3.60E-02	L	--		--		--		1.80E-02	L	2.10E-02	L	--	
BERYLLIUM	--	8.00E-02	U	8.70E-02	U	8.50E-02	U	8.50E-02	U	8.30E-02	U	8.40E-02	U	9.10E-02	U	8.70E-02	U
CADMIUM	--	3.50E-02	J	3.00E-02	J	4.20E-02	J	2.60E-02	J	2.80E-02	J	4.90E-02	J	3.40E-02	J	4.60E-02	J
CHROMIUM	--	3.60E-01		5.30E-01		4.10E-01		4.10E-01		4.70E-01		2.00E-01		2.10E-01		1.90E-01	
COBALT	--	3.50E-01		2.80E-01		3.30E-01		3.10E-01		3.30E-01		1.90E-01		1.60E-01		1.90E-01	
COPPER	--	1.80E+00		2.10E+00		2.10E+00		2.20E+00		2.20E+00		2.10E+00		1.70E+00		1.40E+00	
IRON	--	1.74E+02		1.82E+02		1.73E+02		1.64E+02		2.10E+02		8.00E+01		6.41E+01		7.51E+01	
LEAD	--	8.70E-01		1.10E+00		9.80E-01		1.00E+00		1.40E+00		1.10E-01		9.60E-02		1.00E-01	
MANGANESE	--	2.60E+00		2.10E+00		1.90E+00		2.10E+00		2.60E+00		6.70E-01		5.50E-01		5.80E-01	
MERCURY	--	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U
NICKEL	--	4.00E-01		3.60E-01		3.70E-01		4.00E-01		4.30E-01		5.10E-01		4.20E-01		4.60E-01	
SELENIUM	--	3.10E-01	J	2.80E-01	J	2.60E-01	J	3.20E-01	J	3.50E-01	J	2.90E-01	J	1.90E-01	J	2.30E-01	J
SILVER	--	2.70E-02	L	3.00E-02	L	3.30E-02	L	4.00E-02	L	3.00E-02	L	2.90E-02	L	3.30E-02	L	2.00E-02	L
THALLIUM	--	3.90E-03	J	8.70E-02	U	1.20E-02	J	7.70E-03	J	4.40E-03	J	8.40E-02	U	9.10E-02	U	8.70E-02	U
TIN	--	2.70E-01	J	1.40E-01	J	4.80E-01		2.50E-01	J	1.90E-01	J	4.20E-01	U	4.60E-01	U	4.40E-01	U
ZINC	--	1.34E+01	L	1.25E+01	L	1.38E+01	L	1.53E+01	L	1.52E+01	L	1.73E+01	L	1.29E+01	L	1.55E+01	L
PAHS																	
1-METHYLNAPHTHALENE	Low	1.60E-01	U	1.40E-01	U	1.70E-01	U	1.80E-01	U	1.30E-01	U	3.20E-01	U	3.40E-01	U	2.90E-01	U
2-METHYLNAPHTHALENE	Low	1.60E-01	U	1.40E-01	U	1.70E-01	U	1.80E-01	U	1.30E-01	U	3.20E-01	U	3.40E-01	U	2.90E-01	U
ACENAPHTHENE	Low	5.90E-02	J	4.90E-02	J	9.40E-02	J	6.60E-02	J	1.10E-01	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
ACENAPHTHYLENE	Low	4.00E-02	J	2.80E-02	J	9.80E-02	J	3.60E-02	J	6.00E-02	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
ANTHRACENE	Low	5.60E-01		4.00E-01		8.90E-01		6.80E-01		1.10E+00		3.20E-01	U	3.40E-01	U	2.90E-01	U
BENZO(A)ANTHRACENE	High	2.40E+00	J	1.50E+00	J	2.60E+00	J	2.80E+00	J	4.90E+00	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
BENZO(A)PYRENE	High	1.30E+00		1.10E+00		1.60E+00		1.80E+00		2.40E+00		3.20E-01	U	3.40E-01	U	2.90E-01	U
BENZO(B)FLUORANTHENE	High	8.50E-01		6.90E-01		9.80E-01		1.30E+00		2.00E+00		3.20E-01	U	3.40E-01	U	2.90E-01	U
BENZO(G,H,I)PERYLENE	High	2.20E-01		1.50E-01		2.20E-01		2.80E-01		4.10E-01		3.20E-01	U	3.40E-01	U	2.90E-01	U
BENZO(K)FLUORANTHENE	High	8.70E-01		6.60E-01		9.30E-01		8.50E-01		1.10E+00		3.20E-01	U	3.40E-01	U	2.90E-01	U
CHRYSENE	High	2.40E+00	J	2.20E+00	J	2.40E+00	J	3.90E+00	J	3.90E+00	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
DIBENZO(A,H)ANTHRACENE	High	1.60E-01	U	1.40E-01	U	1.70E-01	U	1.80E-01	U	1.30E-01	U	3.20E-01	U	3.40E-01	U	2.90E-01	U
FLUORANTHENE	Low	1.20E+01	J	9.80E+00	J	1.50E+01	J	1.60E+01	J	2.00E+01	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
FLUORENE	Low	1.60E-01	U	1.40E-01	U	1.70E-01	U	1.80E-01	U	5.00E-02	J	3.20E-01	U	3.40E-01	U	2.90E-01	U
INDENO(1,2,3-CD)PYRENE	High	4.50E-01		1.40E-01	U	4.80E-01		1.80E-01	U	5.80E-01		3.20E-01	U	3.40E-01	U	2.90E-01	U
NAPHTHALENE	Low	3.70E-01		2.90E-01		2.80E-01		3.00E-01		3.70E-01		3.20E-01	U	3.40E-01	U	2.90E-01	U
PHENANTHRENE	Low	6.60E-01		4.50E-01		1.10E+00		8.10E-01		1.20E+00		3.20E-01	U	3.40E-01	U	2.90E-01	U
PYRENE	High	8.40E+00	J	5.50E+00	J	9.90E+00	J	1.00E+01	J	2.70E-01	J	3.20E-01	U	3.40E-01	U	2.90E-01	U

TABLE 5
VALIDATED RESULTS FROM COKE POINT LABORATORY BIOACCUMULATION STUDIES: CLAM TISSUE

Analyte	Chemical Type (Molecular Weight)	Clam Tissue Exposed to Coke Point Sediments (mg/kg wet wt.)										Pre-test Clam Tissue (mg/kg wet wt.)					
		Rep 1: AT0-649A		Rep 2: AT0-649B		Rep 3: AT0-649C		Rep 4: AT0-649D		Rep 5: AT0-649E		PRETEST-A		PRETEST-B		PRETEST-C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCBS																	
PCB 8 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 18 (BZ)	--	1.50E-02	J	1.80E-02	U	1.30E-02	J	1.10E-02	J	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 28 (BZ)	--	1.90E-02	J	8.60E-03	J	1.70E-02	J	1.50E-02	J	8.30E-03	J	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 44 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 49 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 52 (BZ)	--	2.00E-02		1.00E-02	J	1.60E-02	J	1.50E-02	J	8.20E-03	J	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 66 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 77 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 87 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	7.00E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 90 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 101 (BZ)	--	1.00E-02	L	1.80E-02	U	2.10E-02	U	2.20E-02	U	3.50E-02	J	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 105 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.30E-01	J	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 118 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.50E-01	J	1.60E-02	U	7.70E-03	J	1.50E-02	U
PCB 126 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	3.80E-02	J	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 128 (BZ)	--	1.00E-02	J	1.80E-02	U	2.10E-02	U	2.20E-02	U	2.20E-01	U	1.60E-02	U	1.40E-02	J	1.50E-02	U
PCB 138 (BZ)	--	2.20E-02	J	1.80E-02	U	2.10E-02	U	2.20E-02	U	5.60E-01	J	1.60E-02	U	1.80E-02	J	1.50E-02	U
PCB 153 (BZ)	--	1.60E-02	J	1.80E-02	U	2.10E-02	U	2.20E-02	U	2.90E-01	U	1.60E-02	U	2.60E-02		1.50E-02	U
PCB 156 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.50E-01	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 169 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 170 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	2.60E-01	U	1.60E-02	U	2.40E-02	J	1.50E-02	U
PCB 180 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.20E-01	J	1.60E-02	U	2.00E-02	U	1.50E-02	U
PCB 183 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 184 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 187 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	5.80E-02	U	1.60E-02	U	3.40E-02	J	1.50E-02	U
PCB 195 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 206 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U
PCB 209 (BZ)	--	2.00E-02	U	1.80E-02	U	2.10E-02	U	2.20E-02	U	1.70E-02	U	1.60E-02	U	1.70E-02	U	1.50E-02	U

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 6
VALIDATED RESULTS FROM COKE POINT LABORATORY BIOACCUMULATION STUDIES: WORM TISSUE

Analyte	Chemical Type (Molecular Weight)	Worm Tissue Exposed to Coke Point Sediments (mg/kg wet wt.)										Pre-test Worm Tissue (mg/kg wet wt.)					
		Rep 1: AT0-649A		Rep 2: AT0-649B		Rep 3: AT0-649C		Rep 4: AT0-649D		Rep 5: AT0-649E		PRETEST-A		PRETEST-B		PRETEST-C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																	
PERCENT LIPIDS	--	9.10E-01		1.10E+00		8.90E-01		7.90E-01		8.50E-01		6.30E-01		7.70E-01		9.60E-01	
METALS																	
ALUMINUM	--	4.64E+01		4.25E+01		1.23E+01		4.29E+01		2.00E+00	J	1.51E+02		2.46E+02		1.54E+02	
ANTIMONY	--	4.10E-02	J	3.60E-02	J	1.50E-02	J	1.80E-02	J	7.60E-03	J	6.90E-03	J	6.40E-03	J	5.70E-03	J
ARSENIC	--	1.80E+00		2.00E+00		1.80E+00		2.00E+00		1.80E+00		2.30E+00		1.90E+00		2.20E+00	
Speciation (Inorganic As)	--	2.07E-01		1.89E-01		--		--		--		1.52E-01		2.42E-01		--	
Speciation (As III)	--	1.28E-01	L	1.41E-01	L	--		--		--		8.20E-02	L	1.01E-01	L	--	
Speciation (As V)	--	7.90E-02	L	4.80E-02	L	--		--		--		7.00E-02	L	1.41E-01	L	--	
BERYLLIUM	--	8.80E-02	U	3.90E-03	J	7.60E-02	U	7.00E-02	U	8.50E-02	U	5.00E-03	J	9.70E-03	J	7.60E-03	J
CADMIUM	--	3.90E-02	J	3.70E-02	J	2.30E-02	J	3.50E-02	J	2.40E-02	J	8.90E-02	U	2.00E-02	J	1.10E-02	J
CHROMIUM	--	1.20E+00		1.10E+00		3.60E-01		1.00E+00		1.70E-01	B	7.00E-01		9.30E-01		6.80E-01	
COBALT	--	4.60E-01		4.60E-01		3.00E-01		4.90E-01		2.50E-01		1.90E-01		2.30E-01		1.80E-01	
COPPER	--	2.80E+00		2.90E+00		1.50E+00		2.50E+00		1.30E+00		1.40E+00		1.30E+00		1.50E+00	
IRON	--	3.92E+02		3.71E+02		1.41E+02		3.83E+02		7.16E+01		3.56E+02		5.05E+02		3.56E+02	
LEAD	--	2.70E+00		2.60E+00		7.30E-01		2.70E+00		2.00E-01		1.30E+00		5.20E+00		7.30E+00	
MANGANESE	--	6.60E+00		6.70E+00		2.30E+00		7.30E+00		2.40E+00		5.70E+00		8.20E+00		5.90E+00	
MERCURY	--	2.30E-02	J	2.30E-02	J	1.70E-02	J	2.00E-02	J	1.60E-02	J	1.80E-02	J	1.30E-02	J	1.90E-02	J
NICKEL	--	4.40E-01		4.20E-01		3.30E-01		4.30E-01		2.60E-01		4.70E-01		6.10E-01		4.70E-01	
SELENIUM	--	2.80E-01	J	3.00E-01	J	3.00E-01	J	3.60E-01		3.20E-01	J	2.20E-01	J	2.40E-01	J	2.10E-01	J
SILVER	--	3.60E-02	L	4.10E-02	L	2.20E-02	L	4.70E-02	L	3.10E-02	L	3.40E-02	L	2.30E-02	L	6.00E-02	L
THALLIUM	--	1.10E-02	J	1.20E-02	J	5.20E-03	J	4.80E-03	J	3.10E-03	J	2.10E-03	J	5.00E-03	J	6.80E-03	J
TIN	--	8.00E-01		7.00E-01		1.90E-01	J	4.50E-01		4.20E-01	U	4.40E-01	U	3.80E-01	U	3.80E-01	U
ZINC	--	3.45E+01	L	3.46E+01	L	1.02E+01	L	2.55E+01	L	3.76E+01	L	9.80E+00	L	8.30E+00	L	9.00E+00	L
PAHS																	
1-METHYLNAPHTHALENE	Low	3.40E-01	U	8.80E-02	J	2.80E-01	U	3.20E-02	J	2.40E-01	U	1.00E-01	U	2.50E-01	U	2.60E-01	U
2-METHYLNAPHTHALENE	Low	3.40E-01	U	9.80E-02	J	2.80E-01	U	2.70E-01	U	2.40E-01	U	1.00E-01	U	2.50E-01	U	2.60E-01	U
ACENAPHTHENE	Low	1.90E-01	J	2.80E-01		1.40E-01	J	1.50E-01	J	1.50E-01	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
ACENAPHTHYLENE	Low	3.10E-01	J	1.40E-01	J	9.70E-02	J	2.70E-01	U	6.70E-02	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
ANTHRACENE	Low	4.90E-01		4.30E-01		2.90E-01		2.80E-01		3.20E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
BENZO(A)ANTHRACENE	High	1.10E+00	J	1.10E+00	J	9.40E-01	J	7.90E-01	J	6.30E-01	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
BENZO(A)PYRENE	High	1.60E+00		1.30E+00		1.30E+00		1.10E+00		9.50E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
BENZO(B)FLUORANTHENE	High	6.30E-01		4.60E-01		4.80E-01		4.00E-01		2.70E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
BENZO(G,H,I)PERYLENE	High	2.40E-01	J	1.50E-01	J	1.30E-01	J	1.40E-01	J	6.60E+01	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
BENZO(K)FLUORANTHENE	High	4.40E-01		4.10E-01		4.50E-01		2.70E-01		2.40E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
CHRYSENE	High	2.00E+00	J	2.10E+00	J	1.90E+00	J	1.40E+00	J	1.30E+00	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
DIBENZO(A,H)ANTHRACENE	High	9.00E-01		6.60E-01		7.20E-01		7.10E-01		2.40E-01	U	1.00E-01	U	2.50E-01	U	2.60E-01	U
FLUORANTHENE	Low	5.30E+00	J	5.80E+00	J	4.70E+00	J	3.70E+00	J	3.70E+00	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
FLUORENE	Low	3.40E-01	U	8.10E-02	J	2.80E-01	U	2.70E-01	U	2.40E-01	U	1.00E-01	U	2.50E-01	U	2.60E-01	U
INDENO(1,2,3-CD)PYRENE	High	8.70E-01		6.40E-01		6.80E-01		6.70E-01		5.70E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
NAPHTHALENE	Low	1.40E+00		1.40E+00		4.00E-01		1.10E+00		8.80E-02	J	1.00E-01	U	2.50E-01	U	2.60E-01	U
PHENANTHRENE	Low	6.70E-01		5.10E-01		3.60E-01		4.70E-01		5.70E-01		1.00E-01	U	2.50E-01	U	2.60E-01	U
PYRENE	High	2.60E+00	J	2.70E+00	J	2.10E+00	J	1.70E+00	J	1.60E+00	J	1.00E-01	U	2.50E-01	U	2.60E-01	U

TABLE 6
VALIDATED RESULTS FROM COKE POINT LABORATORY BIOACCUMULATION STUDIES: WORM TISSUE

Analyte	Chemical Type (Molecular Weight)	Worm Tissue Exposed to Coke Point Sediments (mg/kg wet wt.)										Pre-test Worm Tissue (mg/kg wet wt.)					
		Rep 1: AT0-649A		Rep 2: AT0-649B		Rep 3: AT0-649C		Rep 4: AT0-649D		Rep 5: AT0-649E		PRETEST-A		PRETEST-B		PRETEST-C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCBS																	
PCB 8 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 18 (BZ)	--	1.60E-02		2.00E-02		1.70E-02		1.60E-02		1.40E-02		1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 28 (BZ)	--	1.00E-02	J	1.50E-02	J	1.30E-02	J	1.10E-02	J	9.80E-03	J	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 44 (BZ)	--	1.30E-02		1.50E-02		1.40E-02		1.20E-02	J	1.10E-02	J	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 49 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 52 (BZ)	--	2.90E-02		3.30E-02		3.10E-02		2.90E-02		2.60E-02		1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 66 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 77 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 87 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 90 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 101 (BZ)	--	1.40E-02		1.40E-02		1.60E-02		1.40E-02		1.30E-02		1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 105 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 118 (BZ)	--	1.30E-02	U	5.50E-03	J	6.60E-03	J	5.70E-03	J	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 126 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 128 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 138 (BZ)	--	1.40E-02	J	1.20E-02	J	1.50E-02	J	1.30E+01	J	1.10E-02	J	6.70E-03	J	1.30E-05	U	4.90E-03	J
PCB 153 (BZ)	--	2.00E-02	J	2.00E-02		2.20E-02		2.10E-02		1.90E-02		9.20E-03	J	1.30E-05	U	7.30E-03	J
PCB 156 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 169 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 170 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 180 (BZ)	--	1.30E-02	U	6.80E-03	J	7.40E-03	J	7.20E-03	J	6.80E-03	J	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 183 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 184 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 187 (BZ)	--	7.60E-03	J	7.50E-03	J	8.00E-03	J	7.80E-03	J	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 195 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 206 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 209 (BZ)	--	1.30E-02	U	1.20E-02	U	1.40E-02	U	1.30E-02	U	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 7
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND LABORATORY BIOACCUMULATION STUDIES: CLAM TISSUE

Analyte	Chemical Type (Molecular Weight)	Clam Tissue Exposed to Patapsco River Background Sediments (mg/kg wet wt.)									
		Rep 1: AT0-650A		Rep 2: AT0-650B		Rep 3: AT0-650C		Rep 4: AT0-650D		Rep 5: AT0-650E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS											
PERCENT LIPIDS	--	4.50E-01		2.90E-01		5.10E-01		5.10E-01		3.40E-01	
METALS											
ALUMINUM	--	1.22E+01		9.20E+00		1.05E+01		1.23E+01		2.92E+01	
ANTIMONY	--	1.80E-02	J	1.80E-02	J	1.70E-02	J	4.60E-02	J	2.40E-02	J
ARSENIC	--	2.30E+00		2.10E+00		2.80E+00		2.10E+00		2.50E+00	
Speciation (Inorganic As)	--	1.05E-01		9.70E-02		--		--		--	
Speciation (As III)	--	7.90E-02	L	7.50E-02	L	--		--		--	
Speciation (As V)	--	2.60E-02	L	2.20E-02	L	--		--		--	
BERYLLIUM	--	8.90E-02	U	9.00E-02	U	8.20E-02	U	8.20E-02	U	8.20E-02	U
CADMIUM	--	3.60E-02	J	3.80E-02	J	5.80E-02	J	3.50E-02	J	3.40E-02	J
CHROMIUM	--	3.10E-01		3.50E-01		3.00E-01		2.70E-01		9.30E-01	
COBALT	--	1.30E-01		1.30E-01		1.90E-01		1.70E-01		1.60E-01	
COPPER	--	1.60E+00		2.00E+00		2.40E+00		1.50E+00		3.30E+00	
IRON	--	7.39E+01		7.43E+01		7.70E+01		7.52E+01		1.10E+02	
LEAD	--	1.90E-01		5.10E-01		2.40E-01		1.70E-01		2.00E-01	
MANGANESE	--	1.70E+00		1.40E+00		1.80E+00		1.50E+00		2.10E+00	
MERCURY	--	3.30E-02	U	3.30E-02	U	1.20E-02	J	3.30E-02	U	3.30E-02	U
NICKEL	--	3.70E-01		3.20E-01		4.30E-01		3.70E-01		5.00E-01	
SELENIUM	--	1.30E-01	J	1.60E-01	J	2.30E-01	J	1.90E-01	J	2.50E-01	J
SILVER	--	2.90E-02	L	4.50E-02	L	4.60E-02	L	2.40E-02	L	4.30E-02	L
THALLIUM	--	3.90E-03	J	3.80E-03	J	3.40E-03	J	3.40E-03	J	3.40E-03	J
TIN	--	4.40E-01	U	1.10E-01	J	3.30E-02	U	1.10E-01	J	4.10E-01	U
ZINC	--	1.09E+01	L	1.11E+01	L	1.65E+01	L	1.09E+01	L	1.10E+01	L
PAHS											
1-METHYLNAPHTHALENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
2-METHYLNAPHTHALENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
ACENAPHTHENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
ACENAPHTHYLENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
ANTHRACENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
BENZO(A)ANTHRACENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
BENZO(A)PYRENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
BENZO(B)FLUORANTHENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
BENZO(G,H,I)PERYLENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
BENZO(K)FLUORANTHENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
CHRYSENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
DIBENZO(A,H)ANTHRACENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
FLUORANTHENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
FLUORENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
INDENO(1,2,3-CD)PYRENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
NAPHTHALENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
PHENANTHRENE	Low	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
PYRENE	High	1.50E-01	U	5.00E-01	U	1.60E-01	U	1.60E-01	U	1.80E-01	U
PCBS											
PCB 8 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 18 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 28 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 44 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 49 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 52 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 66 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 77 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 87 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 90 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 101 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 105 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 118 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 126 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U

TABLE 7
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND LABORATORY BIOACCUMULATION STUDIES: CLAM TISSUE

Analyte	Chemical Type (Molecular Weight)	Clam Tissue Exposed to Patapsco River Background Sediments (mg/kg wet wt.)									
		Rep 1: AT0-650A		Rep 2: AT0-650B		Rep 3: AT0-650C		Rep 4: AT0-650D		Rep 5: AT0-650E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCB 128 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 138 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 153 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 156 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 169 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 170 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 180 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 183 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 184 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 187 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 195 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 206 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U
PCB 209 (BZ)	--	1.80E-02	U	2.50E-02	U	2.00E-02	U	2.00E-02	U	2.20E-02	U

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 8
VALIDATED RESULTS FROM PATAPSCO RIVER LABORATORY BIOACCUMULATION STUDIES: WORM TISSUE

Analyte	Chemical Type (Molecular Weight)	Worm Tissue Exposed to Patapsco River Sediments (mg/kg wet wt.)									
		Rep 1: AT0-650A		Rep 2: AT0-650B		Rep 3: AT0-650C		Rep 4: AT0-650D		Rep 5: AT0-650E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS											
PERCENT LIPIDS	--	1.00E+00		8.90E-01		8.20E-01		8.80E-01		8.60E-01	
METALS											
ALUMINUM	--	6.10E-01	J	1.20E+00	J	4.10E-01	J	1.00E+00	J	2.30E+00	J
ANTIMONY	--	5.20E-03	J	6.10E-03	J	4.20E-03	J	5.10E-03	J	5.40E-03	J
ARSENIC	--	2.50E+00		2.40E+00		2.20E+00		2.30E+00		2.30E+00	
Speciation (Inorganic As)	--	6.00E-03		6.00E-03		--		--		--	
Speciation (As III)	--	4.00E-03	L	5.00E-03	L	--		--		--	
Speciation (As V)	--	--	UL	--	UL	--		--		--	
BERYLLIUM	--	8.70E-02	U	9.10E-02	U	7.70E-02	U	8.10E-02	U	9.10E-02	U
CADMIUM	--	4.40E-02	J	3.10E-02	J	3.80E-02	J	4.30E-02	J	3.30E-02	J
CHROMIUM	--	2.00E-01		2.20E-01		1.70E-01	B	2.00E-01		7.90E-01	
COBALT	--	9.20E-02		9.80E-02		8.20E-02		9.30E-02		8.80E-02	
COPPER	--	1.30E+00		1.40E+00		1.20E+00		1.30E+00		1.30E+00	
IRON	--	6.67E+01		6.28E+01		6.04E+01		6.22E+01		6.30E+01	
LEAD	--	7.60E-02	J	8.10E-02	J	1.10E-01		9.60E-01		1.40E-01	
MANGANESE	--	1.60E+00		1.10E+00		4.50E-01		9.80E-01		1.20E+00	
MERCURY	--	2.50E-02	J	2.70E-02	J	2.50E-02	J	2.20E-02	J	2.40E-02	J
NICKEL	--	2.30E-01		2.30E-01		2.20E-01		2.40E-01		2.70E-01	
SELENIUM	--	4.00E-01	J	2.90E-01	J	2.80E-01	J	3.50E-01	J	2.80E-01	J
SILVER	--	2.60E-02	L	2.70E-02	L	2.40E-02	L	2.50E-02	L	1.70E-02	L
THALLIUM	--	8.70E-02	U	9.10E-02	U	7.70E-02	U	8.10E-02	U	9.10E-02	U
TIN	--	4.40E-01	U	4.60E-01	U	3.80E-01	U	4.00E-01	U	4.60E-01	U
ZINC	--	3.73E+01	L	3.30E+01	L	9.10E+00	L	2.67E+01	L	3.95E+01	L
PAHS											
1-METHYLNAPHTHALENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
2-METHYLNAPHTHALENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
ACENAPHTHENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
ACENAPHTHYLENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
ANTHRACENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
BENZO(A)ANTHRACENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
BENZO(A)PYRENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
BENZO(B)FLUORANTHENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
BENZO(G,H,I)PERYLENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
BENZO(K)FLUORANTHENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
CHRYSENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
DIBENZO(A,H)ANTHRACENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
FLUORANTHENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
FLUORENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U

TABLE 8
VALIDATED RESULTS FROM PATAPSCO RIVER LABORATORY BIOACCUMULATION STUDIES: WORM TISSUE

Analyte	Chemical Type (Molecular Weight)	Worm Tissue Exposed to Patapsco River Sediments (mg/kg wet wt.)									
		Rep 1: AT0-650A		Rep 2: AT0-650B		Rep 3: AT0-650C		Rep 4: AT0-650D		Rep 5: AT0-650E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
INDENO(1,2,3-CD)PYRENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
NAPHTHALENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
PHENANTHRENE	Low	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
PYRENE	High	2.40E-01	U	2.70E-01	U	2.70E-01	U	2.60E-01	U	2.60E-01	U
PCBS											
PCB 8 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 18 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 28 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 44 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 49 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 52 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 66 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 77 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 87 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 90 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 101 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 105 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 118 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 126 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 128 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 138 (BZ)	--	4.80E-03	J	5.10E-03	J	6.40E-03	J	4.80E-03	J	6.30E-03	J
PCB 153 (BZ)	--	9.20E-03	J	8.00E-03	J	1.20E-02	J	9.50E-03	J	1.20E-02	J
PCB 156 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 169 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 170 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 180 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 183 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 184 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 187 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 195 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 206 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U
PCB 209 (BZ)	--	1.20E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U	1.30E-02	U

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 9
VALIDATED RESULTS FROM LABORATORY CONTROL BIOACCUMULATION STUDIES

Analyte	Chemical Type (Molecular Weight)	Control Worm Tissue (mg/kg wet wt.)						Control Clam Tissue (mg/kg wet wt.)					
		Rep 1: AT0-682A		Rep 2: AT0-682B		Rep 3: AT0-682C		Rep 1: AT0-683A		Rep 2: AT0-683B		Rep 3: AT0-683C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS													
PERCENT LIPIDS	--	9.50E-01		9.30E-01		7.50E-01		4.50E-01		4.70E-01		3.50E-01	
METALS													
ALUMINUM	--	7.70E+00		7.40E+00		1.40E+00	J	1.59E+01		1.55E+01		1.09E+01	
ANTIMONY	--	4.70E-02	J	1.20E-02	J	6.90E-03	J	1.70E-02	J	1.30E-02	J	9.90E-03	J
ARSENIC	--	2.30E+00		2.00E+00		2.20E+00		2.70E+00		2.80E+00		2.30E+00	
BERYLLIUM	--	9.30E-02	U	8.30E-02	U	8.00E-02	U	7.90E-02	U	8.70E-02	U	8.80E-02	U
CADMIUM	--	1.70E-02	J	8.30E-02	U	1.40E-02	J	3.90E-02	J	4.60E-02	J	3.40E-02	J
CHROMIUM	--	1.60E-01	B	1.90E-01		1.40E-01	B	2.50E-01		2.50E-01		2.20E-01	
COBALT	--	1.00E-01		8.70E-02		1.00E-01		2.00E-01		1.80E-01		1.70E-01	
COPPER	--	1.40E+00		1.10E+00		9.90E-01		2.60E+00		2.20E+00		1.60E+00	
IRON	--	7.49E+01		6.98E+01		6.04E+01		1.14E+02		1.11E+02		1.06E+02	
LEAD	--	1.70E-01		2.60E-01		4.50E-01		1.30E-01		1.70E-01		1.60E-01	
MANGANESE	--	8.40E-01		4.80E-01		1.60E+00		8.20E-01		9.60E-01		6.00E-01	
MERCURY	--	2.30E-02	J	2.00E-02	J	2.00E-02	J	3.30E-02	U	3.30E-02	U	3.30E-02	U
NICKEL	--	1.50E-01		1.40E-01		1.70E-01		4.70E-01		4.30E-01		4.30E-01	
SELENIUM	--	2.60E-01	J	2.20E-01	J	3.00E-01	J	1.80E-01	J	2.50E-01	J	1.90E-01	J
SILVER	--	3.80E-02	L	2.80E-02	L	2.70E-02	L	2.40E-02	L	4.40E-02	L	3.40E-02	L
THALLIUM	--	2.30E-03	J	8.30E-02	U	8.00E-02	U	7.90E-02	U	8.70E-02	U	8.80E-02	U
TIN	--	4.60E-01	U	4.20E-01	U	4.00E-01	U	4.00E-01	U	4.40E-01	U	4.40E-01	U
ZINC	--	2.20E+01	L	7.70E+00	L	4.87E+01	L	1.16E+01	L	1.42E+01	L	1.14E+01	L
PAHS													
1-METHYLNAPHTHALENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
2-METHYLNAPHTHALENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
ACENAPHTHENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
ACENAPHTHYLENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
ANTHRACENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
BENZO(A)ANTHRACENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
BENZO(A)PYRENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
BENZO(B)FLUORANTHENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
BENZO(G,H,I)PERYLENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
BENZO(K)FLUORANTHENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
CHRYSENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
DIBENZO(A,H)ANTHRACENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
FLUORANTHENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
FLUORENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
INDENO(1,2,3-CD)PYRENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
NAPHTHALENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
PHENANTHRENE	Low	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
PYRENE	High	2.80E-01	U	2.80E-01	U	1.00E-01	U	1.50E-01	U	1.50E-01	U	2.20E-01	U
PCBS													
PCB 8 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 18 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 28 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 44 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 49 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 52 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 66 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 77 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 87 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 90 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 101 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 105 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 118 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 126 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 128 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 138 (BZ)	--	5.20E-03	J	7.10E-03	J	5.60E-03	J	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 153 (BZ)	--	8.50E-03	J	1.30E-02	J	9.60E-03	J	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 156 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 169 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 170 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 180 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U

TABLE 9
VALIDATED RESULTS FROM LABORATORY CONTROL BIOACCUMULATION STUDIES

Analyte	Chemical Type (Molecular Weight)	Control Worm Tissue (mg/kg wet wt.)						Control Clam Tissue (mg/kg wet wt.)					
		Rep 1: AT0-682A		Rep 2: AT0-682B		Rep 3: AT0-682C		Rep 1: AT0-683A		Rep 2: AT0-683B		Rep 3: AT0-683C	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCB 183 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 184 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 187 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 195 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 206 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U
PCB 209 (BZ)	--	1.40E-02	U	1.40E-02	U	1.30E-02	U	1.80E-02	U	1.80E-02	U	2.70E-02	U

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 10

ARSENIC SPECIATION RESULTS FOR TISSUE FROM LABORATORY BIOACCUMULATION TESTS AND FIELD COLLECTED SPECIMENS

Tissue Type	Average of Total As (mg)	Average of Inorganic As (mg)	Average of Percent Inorganic
Laboratory Bioaccumulation Test Tissues			
Coke Point Offshore Area			
Clam	9.46E-01	1.42E-01	15.0%
Worm	9.96E-01	1.98E-01	20.4%
Patapsco River Background Area			
Clam	8.22E-01	1.01E-01	12.7%
Worm	7.37E-01	6.00E-03	0.8%
Pre-Test			
Clam	7.85E-01	9.70E-02	12.4%
Worm	1.41E+00	1.97E-01	13.8%
Field Collected Tissue			
Coke Point Offshore Area			
Crab Meat	1.77E-01	2.00E-02	11.3%
Crab Mustard	8.18E-01	6.25E-02	7.7%
Fish Fillet	2.45E-02	3.00E-03	12.3%
Fish Whole Body	1.62E-01	6.45E-02	38.4%
Patapsco River Background Area			
Crab Meat	2.61E-01	2.20E-02	8.4%
Crab Mustard	6.60E-01	4.75E-02	7.4%
Fish Fillet	2.10E-02	4.00E-03	19.0%
Fish Whole Body	1.07E-01	3.75E-02	34.3%

TABLE 11
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	3.50E-01	4.10E-01	3.82E-01	4.07E-01	5/5	2.90E-01	5.10E-01	4.20E-01	5.16E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
METALS													
ALUMINUM	5/5	1.25E+01	1.49E+01	1.35E+01	1.44E+01	5/5	9.20E+00	2.92E+01	1.47E+01	2.25E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ANTIMONY	5/5	1.30E-02	4.80E-02	3.08E-02	4.40E-02	5/5	1.70E-02	4.60E-02	2.46E-02	3.63E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	5/5	2.10E+00	2.90E+00	2.50E+00	2.80E+00	5/5	2.10E+00	2.80E+00	2.36E+00	2.64E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
BERYLLIUM	0/5	4.00E-02	4.35E-02	4.20E-02	4.33E-02	0/5	4.10E-02	4.55E-02	4.34E-02	4.55E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	5/5	2.60E-02	4.20E-02	3.22E-02	3.83E-02	5/5	3.40E-02	5.80E-02	4.02E-02	4.98E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	5/5	3.60E-01	5.30E-01	4.36E-01	4.98E-01	5/5	2.70E-01	9.30E-01	4.32E-01	6.99E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COBALT	5/5	2.80E-01	3.50E-01	3.20E-01	3.45E-01	5/5	1.30E-01	1.90E-01	1.56E-01	1.81E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COPPER	5/5	1.80E+00	2.20E+00	2.08E+00	2.24E+00	5/5	1.50E+00	3.30E+00	2.16E+00	2.86E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
IRON	5/5	1.64E+02	2.10E+02	1.81E+02	1.97E+02	5/5	7.39E+01	1.10E+02	8.21E+01	9.70E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	5/5	8.70E-01	1.40E+00	1.07E+00	1.26E+00	5/5	1.70E-01	5.10E-01	2.62E-01	3.96E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	1.90E+00	2.60E+00	2.26E+00	2.57E+00	5/5	1.40E+00	2.10E+00	1.70E+00	1.96E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	0/5	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1/5	1.20E-02	1.65E-02	1.56E-02	1.75E-02	NA	Do Not Reject H0	Does Not Exceed Background
NICKEL	5/5	3.60E-01	4.30E-01	3.92E-01	4.18E-01	5/5	3.20E-01	5.00E-01	3.98E-01	4.64E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	5/5	2.60E-01	3.50E-01	3.04E-01	3.37E-01	5/5	1.30E-01	2.50E-01	1.92E-01	2.39E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SILVER	5/5	2.70E-02	4.00E-02	3.20E-02	3.67E-02	5/5	2.40E-02	4.60E-02	3.74E-02	4.71E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
THALLIUM	4/5	3.90E-03	4.35E-02	1.43E-02	3.02E-02	5/5	3.40E-03	3.90E-03	3.58E-03	3.82E-03	NA	Do Not Reject H0	Does Not Exceed Background
TIN	5/5	1.40E-01	4.80E-01	2.66E-01	3.90E-01	2/5	1.10E-01	2.30E-01	1.75E-01	2.32E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ZINC	5/5	1.25E+01	1.53E+01	1.40E+01	1.52E+01	5/5	1.09E+01	1.65E+01	1.21E+01	1.44E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/5	6.50E-02	9.00E-02	7.80E-02	8.79E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	0/5	6.50E-02	9.00E-02	7.80E-02	8.79E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	5/5	4.90E-02	1.10E-01	7.56E-02	9.99E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	5/5	2.80E-02	9.80E-02	5.24E-02	7.92E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	5/5	4.00E-01	1.10E+00	7.26E-01	9.88E-01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)ANTHRACENE	5/5	1.50E+00	4.90E+00	2.84E+00	4.04E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)PYRENE	5/5	1.10E+00	2.40E+00	1.64E+00	2.12E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(B)FLUORANTHENE	5/5	6.90E-01	2.00E+00	1.16E+00	1.66E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(G,H,I)PERYLENE	5/5	1.50E-01	4.10E-01	2.56E-01	3.49E-01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	5/5	6.60E-01	1.10E+00	8.82E-01	1.03E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
CHRYSENE	5/5	2.20E+00	3.90E+00	2.96E+00	3.78E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
DIBENZO(A,H)ANTHRACENE	0/5	6.50E-02	9.00E-02	7.80E-02	8.79E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
FLUORANTHENE	5/5	9.80E+00	2.00E+01	1.46E+01	1.83E+01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORENE	1/5	5.00E-02	9.00E-02	7.50E-02	9.01E-02	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	3/5	7.00E-02	5.80E-01	3.34E-01	5.60E-01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
NAPHTHALENE	5/5	2.80E-01	3.70E-01	3.22E-01	3.64E-01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	NA	Do Not Reject H0	Does Not Exceed Background
PHENANTHRENE	5/5	4.50E-01	1.20E+00	8.44E-01	1.14E+00	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
PYRENE	5/5	2.70E-01	1.00E+01	6.81E+00	1.07E+01	0/5	7.50E-02	2.50E-01	1.15E-01	1.87E-01	**Reject H0**	**Reject H0**	**Exceeds Background**

TABLE 11
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	5/5	1.18E+01	2.09E+01	1.69E+01	2.02E+01	0/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	5/5	1.21E+01	2.13E+01	1.71E+01	2.04E+01	0/5	1.35E+00	4.50E+00	2.07E+00	3.37E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	5/5	1.10E+01	2.29E+01	1.66E+01	2.09E+01	0/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = DL)	5/5	1.14E+01	2.32E+01	1.70E+01	2.13E+01	0/5	1.35E+00	4.50E+00	2.07E+00	3.37E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	3/5	8.50E-03	1.50E-02	1.13E-02	1.39E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	5/5	8.30E-03	1.90E-02	1.36E-02	1.82E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	5/5	8.20E-03	2.00E-02	1.38E-02	1.84E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 66 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	1/5	9.00E-03	7.00E-02	2.21E-02	4.76E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 90 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	2/5	9.00E-03	3.50E-02	1.51E-02	2.57E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 105 (BZ)	1/5	9.00E-03	1.30E-01	3.41E-02	8.52E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 118 (BZ)	1/5	9.00E-03	1.50E-01	3.81E-02	9.77E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 126 (BZ)	1/5	9.00E-03	3.80E-02	1.57E-02	2.76E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 128 (BZ)	2/5	9.00E-03	2.20E-01	5.21E-02	1.42E-01	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 138 (BZ)	2/5	9.00E-03	5.60E-01	1.23E-01	3.56E-01	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 153 (BZ)	2/5	9.00E-03	2.90E-01	6.73E-02	1.86E-01	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 156 (BZ)	1/5	9.00E-03	1.50E-01	3.81E-02	9.77E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 169 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	1/5	9.00E-03	2.60E-01	6.01E-02	1.67E-01	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 180 (BZ)	1/5	9.00E-03	1.20E-01	3.21E-02	7.90E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 183 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	1/5	9.00E-03	5.80E-02	1.97E-02	4.01E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 195 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/5	8.50E-03	1.10E-02	9.80E-03	1.08E-02	0/5	9.00E-03	1.25E-02	1.05E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	5/5	3.72E-02	3.76E+00	8.38E-01	2.39E+00	0/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	5/5	6.13E-01	3.96E+00	1.34E+00	2.74E+00	0/5	6.48E-01	9.00E-01	7.56E-01	8.47E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 12
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	7.90E-01	1.10E+00	9.08E-01	1.02E+00	5/5	8.20E-01	1.00E+00	8.90E-01	9.54E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	5/5	2.00E+00	4.64E+01	2.92E+01	4.88E+01	5/5	4.10E-01	2.30E+00	1.10E+00	1.81E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTIMONY	5/5	7.60E-03	4.10E-02	2.35E-02	3.72E-02	5/5	4.20E-03	6.10E-03	5.20E-03	5.85E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	5/5	1.80E+00	2.00E+00	1.88E+00	1.98E+00	5/5	2.20E+00	2.50E+00	2.34E+00	2.45E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	1/5	3.90E-03	4.40E-02	3.27E-02	4.84E-02	0/5	3.85E-02	4.55E-02	4.27E-02	4.57E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	5/5	2.30E-02	3.90E-02	3.16E-02	3.88E-02	5/5	3.10E-02	4.40E-02	3.78E-02	4.33E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	5/5	1.70E-01	1.20E+00	7.66E-01	1.21E+00	5/5	1.70E-01	7.90E-01	3.16E-01	5.69E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COBALT	5/5	2.50E-01	4.90E-01	3.92E-01	4.96E-01	5/5	8.20E-02	9.80E-02	9.06E-02	9.63E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COPPER	5/5	1.30E+00	2.90E+00	2.20E+00	2.91E+00	5/5	1.20E+00	1.40E+00	1.30E+00	1.37E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	5/5	7.16E+01	3.92E+02	2.72E+02	4.18E+02	5/5	6.04E+01	6.67E+01	6.30E+01	6.52E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	5/5	2.00E-01	2.70E+00	1.79E+00	2.95E+00	5/5	7.60E-02	9.60E-01	2.73E-01	6.40E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	2.30E+00	7.30E+00	5.06E+00	7.43E+00	5/5	4.50E-01	1.60E+00	1.07E+00	1.46E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	5/5	1.60E-02	2.30E-02	1.98E-02	2.29E-02	5/5	2.20E-02	2.70E-02	2.46E-02	2.63E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
NICKEL	5/5	2.60E-01	4.40E-01	3.76E-01	4.51E-01	5/5	2.20E-01	2.70E-01	2.38E-01	2.56E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SELENIUM	5/5	2.80E-01	3.60E-01	3.12E-01	3.41E-01	5/5	2.80E-01	4.00E-01	3.20E-01	3.71E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SILVER	5/5	2.20E-02	4.70E-02	3.54E-02	4.45E-02	5/5	1.70E-02	2.70E-02	2.38E-02	2.76E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
THALLIUM	5/5	3.10E-03	1.20E-02	7.22E-03	1.10E-02	0/5	3.85E-02	4.55E-02	4.27E-02	4.57E-02	NA	Do Not Reject H0	Does Not Exceed Background
TIN	4/5	1.90E-01	8.00E-01	4.70E-01	7.35E-01	0/5	1.90E-01	2.30E-01	2.14E-01	2.31E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ZINC	5/5	1.02E+01	3.76E+01	2.85E+01	3.91E+01	5/5	9.10E+00	3.95E+01	2.91E+01	4.08E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	2/5	3.20E-02	1.70E-01	1.10E-01	1.60E-01	0/4	1.20E-01	1.35E-01	1.30E-01	1.36E-01	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	1/5	9.80E-02	1.70E-01	1.33E-01	1.58E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	5/5	1.40E-01	2.80E-01	1.82E-01	2.37E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ACENAPHTHYLENE	4/5	6.70E-02	3.10E-01	1.50E-01	2.40E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTHRACENE	5/5	2.80E-01	4.90E-01	3.62E-01	4.51E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)ANTHRACENE	5/5	6.30E-01	1.10E+00	9.12E-01	1.11E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)PYRENE	5/5	9.50E-01	1.60E+00	1.25E+00	1.48E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(B)FLUORANTHENE	5/5	2.70E-01	6.30E-01	4.48E-01	5.73E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(G,H,I)PERYLENE	5/5	6.60E-02	2.40E-01	1.45E-01	2.05E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	5/5	2.40E-01	4.50E-01	3.62E-01	4.57E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
CHRYSENE	5/5	1.30E+00	2.10E+00	1.74E+00	2.09E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
DIBENZO(A,H)ANTHRACENE	4/5	1.20E-01	9.00E-01	6.22E-01	9.03E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORANTHENE	5/5	3.70E+00	5.80E+00	4.64E+00	5.54E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORENE	1/5	8.10E-02	1.70E-01	1.29E-01	1.60E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	5/5	5.70E-01	8.70E-01	6.86E-01	7.92E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
NAPHTHALENE	5/5	8.80E-02	1.40E+00	8.78E-01	1.45E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
PHENANTHRENE	5/5	3.60E-01	6.70E-01	5.16E-01	6.26E-01	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
PYRENE	5/5	1.60E+00	2.70E+00	2.14E+00	2.62E+00	0/5	1.20E-01	1.35E-01	1.30E-01	1.36E-01	**Reject H0**	**Reject H0**	**Exceeds Background**

TABLE 12
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	5/5	5.63E+00	1.04E+01	8.28E+00	1.01E+01	0/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	5/5	5.87E+00	1.04E+01	8.33E+00	1.01E+01	0/5	2.16E+00	2.43E+00	2.34E+00	2.45E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	5/5	4.90E+00	8.83E+00	6.76E+00	8.41E+00	0/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = DL)	5/5	5.62E+00	9.38E+00	7.44E+00	8.96E+00	0/5	2.16E+00	2.43E+00	2.34E+00	2.45E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	5/5	1.40E-02	2.00E-02	1.66E-02	1.87E-02	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 28 (BZ)	5/5	9.80E-03	1.50E-02	1.18E-02	1.39E-02	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 44 (BZ)	5/5	1.10E-02	1.50E-02	1.30E-02	1.45E-02	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 49 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	5/5	2.60E-02	3.30E-02	2.96E-02	3.21E-02	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 66 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 90 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	5/5	1.30E-02	1.60E-02	1.42E-02	1.52E-02	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 105 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	3/5	5.50E-03	6.60E-03	6.06E-03	6.52E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 128 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	5/5	1.10E-02	1.50E-02	1.30E-02	1.45E-02	5/5	4.80E-03	6.40E-03	5.48E-03	6.25E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 153 (BZ)	5/5	1.90E-02	2.20E-02	2.04E-02	2.15E-02	5/5	8.00E-03	1.20E-02	1.01E-02	1.18E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 156 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	4/5	6.50E-03	7.40E-03	6.94E-03	7.28E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	4/5	6.00E-03	8.00E-03	7.38E-03	8.14E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/5	6.00E-03	7.00E-03	6.40E-03	6.80E-03	0/5	6.00E-03	6.50E-03	6.40E-03	6.61E-03	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	5/5	2.21E-01	3.00E-01	2.68E-01	3.00E-01	0/5	2.62E-02	3.68E-02	3.12E-02	3.61E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	5/5	4.61E-01	5.24E-01	4.93E-01	5.16E-01	0/5	4.12E-01	4.53E-01	4.41E-01	4.57E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 13
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Coke Point Offshore Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	3/3	3.00E-01	3.90E-01	3.50E-01	4.27E-01	5/5	3.50E-01	4.10E-01	3.82E-01	4.07E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	3/3	4.60E+00	1.02E+01	6.70E+00	1.18E+01	5/5	1.25E+01	1.49E+01	1.35E+01	1.44E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTIMONY	3/3	1.20E-02	1.40E-02	1.30E-02	1.47E-02	5/5	1.30E-02	4.80E-02	3.08E-02	4.40E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	3/3	2.60E+00	3.00E+00	2.80E+00	3.14E+00	5/5	2.10E+00	2.90E+00	2.50E+00	2.80E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	0/3	4.20E-02	4.55E-02	--	4.55E-02	0/5	4.00E-02	4.35E-02	--	4.35E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	3/3	3.40E-02	4.90E-02	4.30E-02	5.64E-02	5/5	2.60E-02	4.20E-02	3.22E-02	3.83E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	3/3	1.90E-01	2.10E-01	2.00E-01	2.17E-01	5/5	3.60E-01	5.30E-01	4.36E-01	4.98E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COBALT	3/3	1.60E-01	1.90E-01	1.80E-01	2.09E-01	5/5	2.80E-01	3.50E-01	3.20E-01	3.45E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COPPER	3/3	1.40E+00	2.10E+00	1.73E+00	2.33E+00	5/5	1.80E+00	2.20E+00	2.08E+00	2.24E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	3/3	6.41E+01	8.00E+01	7.31E+01	8.68E+01	5/5	1.64E+02	2.10E+02	1.81E+02	1.97E+02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	3/3	9.60E-02	1.10E-01	1.02E-01	1.14E-01	5/5	8.70E-01	1.40E+00	1.07E+00	1.26E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	3/3	5.50E-01	6.70E-01	6.00E-01	7.05E-01	5/5	1.90E+00	2.60E+00	2.26E+00	2.57E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	0/3	1.65E-02	1.65E-02	--	1.65E-02	0/5	1.65E-02	1.65E-02	--	1.65E-02	NA	Do Not Reject H0	Does Not Exceed Background
NICKEL	3/3	4.20E-01	5.10E-01	4.63E-01	5.39E-01	5/5	3.60E-01	4.30E-01	3.92E-01	4.18E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	3/3	1.90E-01	2.90E-01	2.37E-01	3.22E-01	5/5	2.60E-01	3.50E-01	3.04E-01	3.37E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SILVER	3/3	2.00E-02	3.30E-02	2.73E-02	3.86E-02	5/5	2.70E-02	4.00E-02	3.20E-02	3.67E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
THALLIUM	0/3	4.20E-02	4.55E-02	--	4.55E-02	4/5	3.90E-03	4.35E-02	1.43E-02	3.02E-02	NA	Do Not Reject H0	Does Not Exceed Background
TIN	0/3	2.10E-01	2.30E-01	--	2.30E-01	5/5	1.40E-01	4.80E-01	2.66E-01	3.90E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ZINC	3/3	1.29E+01	1.73E+01	1.52E+01	1.90E+01	5/5	1.25E+01	1.53E+01	1.40E+01	1.52E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	6.50E-02	9.00E-02	--	9.00E-02	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	6.50E-02	9.00E-02	--	9.00E-02	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	4.90E-02	1.10E-01	7.56E-02	9.99E-02	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	2.80E-02	9.80E-02	5.24E-02	7.92E-02	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	4.00E-01	1.10E+00	7.26E-01	9.88E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	1.50E+00	4.90E+00	2.84E+00	4.04E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	1.10E+00	2.40E+00	1.64E+00	2.12E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(B)FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	6.90E-01	2.00E+00	1.16E+00	1.66E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(G,H,I)PERYLENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	1.50E-01	4.10E-01	2.56E-01	3.49E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
BENZO(K)FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	6.60E-01	1.10E+00	8.82E-01	1.03E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
CHRYSENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	2.20E+00	3.90E+00	2.96E+00	3.78E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
DIBENZO(A,H)ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	6.50E-02	9.00E-02	--	9.00E-02			
FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	9.80E+00	2.00E+01	1.46E+01	1.83E+01	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	1/5	5.00E-02	9.00E-02	7.50E-02	9.01E-02	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	3/5	7.00E-02	5.80E-01	3.34E-01	5.60E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

TABLE 13
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Coke Point Offshore Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
NAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	2.80E-01	3.70E-01	3.22E-01	3.64E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PHENANTHRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	4.50E-01	1.20E+00	8.44E-01	1.14E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	5/5	2.70E-01	1.00E+01	6.81E+00	1.07E+01	**Reject H0**	**Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	1.18E+01	2.09E+01	1.69E+01	2.02E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	3/3	2.61E+00	3.06E+00	2.85E+00	3.23E+00	5/5	1.21E+01	2.13E+01	1.71E+01	2.04E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	1.10E+01	2.29E+01	1.66E+01	2.09E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = DL)	3/3	2.61E+00	3.06E+00	2.85E+00	3.23E+00	5/5	1.14E+01	2.32E+01	1.70E+01	2.13E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	3/5	8.50E-03	1.50E-02	1.13E-02	1.39E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	5/5	8.30E-03	1.90E-02	1.36E-02	1.82E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 44 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	5/5	8.20E-03	2.00E-02	1.38E-02	1.84E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 66 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	1/5	9.00E-03	7.00E-02	2.21E-02	4.76E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 90 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	2/5	9.00E-03	3.50E-02	1.51E-02	2.57E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 105 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	1/5	9.00E-03	1.30E-01	3.41E-02	8.52E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 118 (BZ)	1/3	7.50E-03	8.00E-03	7.73E-03	8.16E-03	1/5	9.00E-03	1.50E-01	3.81E-02	9.77E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 126 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	1/5	9.00E-03	3.80E-02	1.57E-02	2.76E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 128 (BZ)	1/3	7.50E-03	1.40E-02	9.83E-03	1.59E-02	2/5	9.00E-03	2.20E-01	5.21E-02	1.42E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 138 (BZ)	1/3	7.50E-03	1.80E-02	1.12E-02	2.12E-02	2/5	9.00E-03	5.60E-01	1.23E-01	3.56E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 153 (BZ)	1/3	7.50E-03	2.60E-02	1.38E-02	3.16E-02	2/5	9.00E-03	2.90E-01	6.73E-02	1.86E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 156 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	1/5	9.00E-03	1.50E-01	3.81E-02	9.77E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 169 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	1/3	7.50E-03	2.40E-02	1.32E-02	2.90E-02	1/5	9.00E-03	2.60E-01	6.01E-02	1.67E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 180 (BZ)	1/3	7.50E-03	2.00E-02	1.18E-02	2.38E-02	1/5	9.00E-03	1.20E-01	3.21E-02	7.90E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 183 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	1/3	7.50E-03	3.40E-02	1.65E-02	4.21E-02	1/5	9.00E-03	5.80E-02	1.97E-02	4.01E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 195 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	8.50E-03	1.10E-02	--	1.10E-02	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	3/3	0.00E+00	2.87E-01	9.58E-02	3.76E-01	5/5	3.72E-02	3.76E+00	8.38E-01	2.39E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	3/3	5.40E-01	6.61E-01	5.92E-01	6.98E-01	5/5	6.13E-01	3.96E+00	1.34E+00	2.74E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Pre-Test concentration.

A) The data presented in the 95% UCLM column represents the recommended exposure point concentration (EPC) for use in the reasonable maximum exposure scenario of the risk assessment. When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 14
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Coke Point Offshore Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	3/3	6.30E-01	9.60E-01	7.87E-01	1.07E+00	5/5	7.90E-01	1.10E+00	9.08E-01	1.02E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	3/3	1.51E+02	2.46E+02	1.84E+02	2.75E+02	5/5	2.00E+00	4.64E+01	2.92E+01	4.88E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ANTIMONY	3/3	5.70E-03	6.90E-03	6.33E-03	7.35E-03	5/5	7.60E-03	4.10E-02	2.35E-02	3.72E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	3/3	1.90E+00	2.30E+00	2.13E+00	2.48E+00	5/5	1.80E+00	2.00E+00	1.88E+00	1.98E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	3/3	5.00E-03	9.70E-03	7.43E-03	1.14E-02	1/5	3.90E-03	4.40E-02	3.27E-02	4.84E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	2/3	1.10E-02	4.45E-02	2.52E-02	5.44E-02	5/5	2.30E-02	3.90E-02	3.16E-02	3.88E-02	NA	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	3/3	6.80E-01	9.30E-01	7.70E-01	1.00E+00	5/5	1.70E-01	1.20E+00	7.66E-01	1.21E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COBALT	3/3	1.80E-01	2.30E-01	2.00E-01	2.45E-01	5/5	2.50E-01	4.90E-01	3.92E-01	4.96E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COPPER	3/3	1.30E+00	1.50E+00	1.40E+00	1.57E+00	5/5	1.30E+00	2.90E+00	2.20E+00	2.91E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	3/3	3.56E+02	5.05E+02	4.06E+02	5.51E+02	5/5	7.16E+01	3.92E+02	2.72E+02	4.18E+02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
LEAD	3/3	1.30E+00	7.30E+00	4.60E+00	9.73E+00	5/5	2.00E-01	2.70E+00	1.79E+00	2.95E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MANGANESE	3/3	5.70E+00	8.20E+00	6.60E+00	8.94E+00	5/5	2.30E+00	7.30E+00	5.06E+00	7.43E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MERCURY	3/3	1.30E-02	1.90E-02	1.67E-02	2.21E-02	5/5	1.60E-02	2.30E-02	1.98E-02	2.29E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
NICKEL	3/3	4.70E-01	6.10E-01	5.17E-01	6.53E-01	5/5	2.60E-01	4.40E-01	3.76E-01	4.51E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	3/3	2.10E-01	2.40E-01	2.23E-01	2.49E-01	5/5	2.80E-01	3.60E-01	3.12E-01	3.41E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SILVER	3/3	2.30E-02	6.00E-02	3.90E-02	7.10E-02	5/5	2.20E-02	4.70E-02	3.54E-02	4.45E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
THALLIUM	3/3	2.10E-03	6.80E-03	4.63E-03	8.63E-03	5/5	3.10E-03	1.20E-02	7.22E-03	1.10E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TIN	0/3	1.90E-01	2.20E-01	--	2.20E-01	4/5	1.90E-01	8.00E-01	4.70E-01	7.35E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ZINC	3/3	8.30E+00	9.80E+00	9.03E+00	1.03E+01	5/5	1.02E+01	3.76E+01	2.85E+01	3.91E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PAHS													
1-METHYLNAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	2/5	3.20E-02	1.70E-01	1.10E-01	1.60E-01	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	1/5	9.80E-02	1.70E-01	1.33E-01	1.58E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	1.40E-01	2.80E-01	1.82E-01	2.37E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ACENAPHTHYLENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	4/5	6.70E-02	3.10E-01	1.50E-01	2.40E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	2.80E-01	4.90E-01	3.62E-01	4.51E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	6.30E-01	1.10E+00	9.12E-01	1.11E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(A)PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	9.50E-01	1.60E+00	1.25E+00	1.48E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(B)FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	2.70E-01	6.30E-01	4.48E-01	5.73E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
BENZO(G,H,I)PERYLENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	6.60E-02	2.40E-01	1.45E-01	2.05E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	2.40E-01	4.50E-01	3.62E-01	4.57E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
CHRYSENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	1.30E+00	2.10E+00	1.74E+00	2.09E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
DIBENZO(A,H)ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	4/5	1.20E-01	9.00E-01	6.22E-01	9.03E-01			
FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	3.70E+00	5.80E+00	4.64E+00	5.54E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	1/5	8.10E-02	1.70E-01	1.29E-01	1.60E-01	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	5.70E-01	8.70E-01	6.86E-01	7.92E-01	**Reject H0**	**Reject H0**	**Exceeds Background**
NAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	8.80E-02	1.40E+00	8.78E-01	1.45E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
PHENANTHRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	3.60E-01	6.70E-01	5.16E-01	6.26E-01	**Reject H0**	**Reject H0**	**Exceeds Background**

TABLE 14
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Coke Point Offshore Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	5/5	1.60E+00	2.70E+00	2.14E+00	2.62E+00	**Reject H0**	**Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	5.63E+00	1.04E+01	8.28E+00	1.01E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	3/3	9.00E-01	2.34E+00	1.83E+00	3.19E+00	5/5	5.87E+00	1.04E+01	8.33E+00	1.01E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	4.90E+00	8.83E+00	6.76E+00	8.41E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = DL)	3/3	9.00E-01	2.34E+00	1.83E+00	3.19E+00	5/5	5.62E+00	9.38E+00	7.44E+00	8.96E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	5/5	1.40E-02	2.00E-02	1.66E-02	1.87E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 28 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	5/5	9.80E-03	1.50E-02	1.18E-02	1.39E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 44 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	5/5	1.10E-02	1.50E-02	1.30E-02	1.45E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 49 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	5/5	2.60E-02	3.30E-02	2.96E-02	3.21E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 66 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 90 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	5/5	1.30E-02	1.60E-02	1.42E-02	1.52E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 105 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	3/5	5.50E-03	6.60E-03	6.06E-03	6.52E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 128 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	2/3	4.90E-03	6.70E-03	6.03E-03	7.70E-03	5/5	1.10E-02	1.50E-02	1.30E-02	1.45E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 153 (BZ)	2/3	6.50E-03	9.20E-03	7.67E-03	1.00E-02	5/5	1.90E-02	2.20E-02	2.04E-02	2.15E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
PCB 156 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	4/5	6.50E-03	7.40E-03	6.94E-03	7.28E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	4/5	6.00E-03	8.00E-03	7.38E-03	8.14E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	7.00E-03	--	7.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	3/3	6.50E-03	6.50E-03	6.50E-03	4.68E-02	5/5	2.21E-01	3.00E-01	2.68E-01	3.00E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	3/3	6.50E-03	6.50E-03	6.50E-03	4.76E-01	5/5	4.61E-01	5.24E-01	4.93E-01	5.16E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Pre-Test concentration.

A) The data presented in the 95% UCLM column represents the recommended exposure point concentration (EPC) for use in the reasonable maximum exposure scenario of the risk assessment. When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 15
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE PATAPSCO RIVER BACKGROUND AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	3/3	3.00E-01	3.90E-01	3.50E-01	4.27E-01	5/5	2.90E-01	5.10E-01	4.20E-01	5.16E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	3/3	4.60E+00	1.02E+01	6.70E+00	1.18E+01	5/5	9.20E+00	2.92E+01	1.47E+01	2.25E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTIMONY	3/3	1.20E-02	1.40E-02	1.30E-02	1.47E-02	5/5	1.70E-02	4.60E-02	2.46E-02	3.63E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	3/3	2.60E+00	3.00E+00	2.80E+00	3.14E+00	5/5	2.10E+00	2.80E+00	2.36E+00	2.64E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	0/3	4.20E-02	4.55E-02	--	4.55E-02	0/5	4.10E-02	4.55E-02	--	4.55E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	3/3	3.40E-02	4.90E-02	4.30E-02	5.64E-02	5/5	3.40E-02	5.80E-02	4.02E-02	4.98E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
CHROMIUM	3/3	1.90E-01	2.10E-01	2.00E-01	2.17E-01	5/5	2.70E-01	9.30E-01	4.32E-01	6.99E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COBALT	3/3	1.60E-01	1.90E-01	1.80E-01	2.09E-01	5/5	1.30E-01	1.90E-01	1.56E-01	1.81E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COPPER	3/3	1.40E+00	2.10E+00	1.73E+00	2.33E+00	5/5	1.50E+00	3.30E+00	2.16E+00	2.86E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	3/3	6.41E+01	8.00E+01	7.31E+01	8.68E+01	5/5	7.39E+01	1.10E+02	8.21E+01	9.70E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	3/3	9.60E-02	1.10E-01	1.02E-01	1.14E-01	5/5	1.70E-01	5.10E-01	2.62E-01	3.96E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	3/3	5.50E-01	6.70E-01	6.00E-01	7.05E-01	5/5	1.40E+00	2.10E+00	1.70E+00	1.96E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	0/3	1.65E-02	1.65E-02	--	1.65E-02	1/5	1.20E-02	1.65E-02	1.56E-02	1.75E-02	NA	Do Not Reject H0	Does Not Exceed Background
NICKEL	3/3	4.20E-01	5.10E-01	4.63E-01	5.39E-01	5/5	3.20E-01	5.00E-01	3.98E-01	4.64E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	3/3	1.90E-01	2.90E-01	2.37E-01	3.22E-01	5/5	1.30E-01	2.50E-01	1.92E-01	2.39E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SILVER	3/3	2.00E-02	3.30E-02	2.73E-02	3.86E-02	5/5	2.40E-02	4.60E-02	3.74E-02	4.71E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
THALLIUM	0/3	4.20E-02	4.55E-02	--	4.55E-02	5/5	3.40E-03	3.90E-03	3.58E-03	3.82E-03	NA	Do Not Reject H0	Does Not Exceed Background
TIN	0/3	2.10E-01	2.30E-01	--	2.30E-01	2/5	1.10E-01	2.30E-01	1.75E-01	2.32E-01	NA	Do Not Reject H0	Does Not Exceed Background
ZINC	3/3	1.29E+01	1.73E+01	1.52E+01	1.90E+01	5/5	1.09E+01	1.65E+01	1.21E+01	1.44E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(B)FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(G,H,I)PERYLENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
CHRYSENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
DIBENZO(A,H)ANTHRACENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01			
FLUORANTHENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
FLUORENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
NAPHTHALENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background

TABLE 15
STATISTICAL COMPARISONS BETWEEN CLAM TISSUE COLLECTED AT THE PATAPSCO RIVER BACKGROUND AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
PHENANTHRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	0/3	1.45E-01	1.70E-01	--	1.70E-01	0/5	7.50E-02	2.50E-01	--	2.50E-01	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL HMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL HMW PAH (ND = DL)	3/3	2.61E+00	3.06E+00	2.85E+00	3.23E+00	5/5	1.35E+00	4.50E+00	2.07E+00	3.37E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL LMW PAH (ND = DL)	3/3	2.61E+00	3.06E+00	2.85E+00	3.23E+00	5/5	1.35E+00	4.50E+00	2.07E+00	3.37E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 66 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 90 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 105 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	1/3	7.50E-03	8.00E-03	7.73E-03	8.16E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 128 (BZ)	1/3	7.50E-03	1.40E-02	9.83E-03	1.59E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	1/3	7.50E-03	1.80E-02	1.12E-02	2.12E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 153 (BZ)	1/3	7.50E-03	2.60E-02	1.38E-02	3.16E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 156 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	1/3	7.50E-03	2.40E-02	1.32E-02	2.90E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	1/3	7.50E-03	2.00E-02	1.18E-02	2.38E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	1/3	7.50E-03	3.40E-02	1.65E-02	4.21E-02	0/5	9.00E-03	1.25E-02	--	1.25E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/3	7.50E-03	8.50E-03	--	8.50E-03	0/5	9.00E-03	1.25E-02	--	1.25E-02	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	3/3	0.00E+00	2.87E-01	9.58E-02	3.76E-01	5/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = DL)	3/3	5.40E-01	6.61E-01	5.92E-01	6.98E-01	5/5	6.48E-01	9.00E-01	7.56E-01	8.47E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Patapsco River Background Area detected chemical concentration statistically exceeds Pre-Test cencentration.

A) The data presented in the 95% UCLM column represents the recommended exposure point concentration (EPC) for use in the reasonable maximum exposure scenario of the risk assessment. When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 16
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE PATAPSCO RIVER BACKGROUND AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	3/3	6.30E-01	9.60E-01	7.87E-01	1.07E+00	5/5	8.20E-01	1.00E+00	8.90E-01	9.54E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	3/3	1.51E+02	2.46E+02	1.84E+02	2.75E+02	5/5	4.10E-01	2.30E+00	1.10E+00	1.81E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ANTIMONY	3/3	5.70E-03	6.90E-03	6.33E-03	7.35E-03	5/5	4.20E-03	6.10E-03	5.20E-03	5.85E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ARSENIC	3/3	1.90E+00	2.30E+00	2.13E+00	2.48E+00	5/5	2.20E+00	2.50E+00	2.34E+00	2.45E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
BERYLLIUM	3/3	5.00E-03	9.70E-03	7.43E-03	1.14E-02	0/5	3.85E-02	4.55E-02	--	4.55E-02	NA	Do Not Reject H0	Does Not Exceed Background
CADMIUM	2/3	1.10E-02	4.45E-02	2.52E-02	5.44E-02	5/5	3.10E-02	4.40E-02	3.78E-02	4.33E-02	NA	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	3/3	6.80E-01	9.30E-01	7.70E-01	1.00E+00	5/5	1.70E-01	7.90E-01	3.16E-01	5.69E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COBALT	3/3	1.80E-01	2.30E-01	2.00E-01	2.45E-01	5/5	8.20E-02	9.80E-02	9.06E-02	9.63E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COPPER	3/3	1.30E+00	1.50E+00	1.40E+00	1.57E+00	5/5	1.20E+00	1.40E+00	1.30E+00	1.37E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
IRON	3/3	3.56E+02	5.05E+02	4.06E+02	5.51E+02	5/5	6.04E+01	6.67E+01	6.30E+01	6.52E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
LEAD	3/3	1.30E+00	7.30E+00	4.60E+00	9.73E+00	5/5	7.60E-02	9.60E-01	2.73E-01	6.40E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MANGANESE	3/3	5.70E+00	8.20E+00	6.60E+00	8.94E+00	5/5	4.50E-01	1.60E+00	1.07E+00	1.46E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MERCURY	3/3	1.30E-02	1.90E-02	1.67E-02	2.21E-02	0/5	2.20E-02	2.70E-02	2.46E-02	2.63E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
NICKEL	3/3	4.70E-01	6.10E-01	5.17E-01	6.53E-01	5/5	2.20E-01	2.70E-01	2.38E-01	2.56E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	3/3	2.10E-01	2.40E-01	2.23E-01	2.49E-01	5/5	2.80E-01	4.00E-01	3.20E-01	3.71E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SILVER	3/3	2.30E-02	6.00E-02	3.90E-02	7.10E-02	5/5	1.70E-02	2.70E-02	2.38E-02	2.76E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
THALLIUM	3/3	2.10E-03	6.80E-03	4.63E-03	8.63E-03	0/5	3.85E-02	4.55E-02	--	4.55E-02	NA	Do Not Reject H0	Does Not Exceed Background
TIN	0/3	1.90E-01	2.20E-01	--	2.20E-01	0/5	1.90E-01	2.30E-01	--	2.30E-01	NA	Do Not Reject H0	Does Not Exceed Background
ZINC	3/3	8.30E+00	9.80E+00	9.03E+00	1.03E+01	5/5	9.10E+00	3.95E+01	2.91E+01	4.08E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PAHS													
1-METHYLNAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
2-METHYLNAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(B)FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(G,H,I)PERYLENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
CHRYSENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
DIBENZO(A,H)ANTHRACENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01			
FLUORANTHENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
FLUORENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
NAPHTHALENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background

TABLE 16
STATISTICAL COMPARISONS BETWEEN WORM TISSUE COLLECTED AT THE PATAPSCO RIVER BACKGROUND AREA AND PRE-TEST TISSUE CONCENTRATIONS

Analyte	Reference: Pre-test (mg/kg)					Treatment: Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
PHENANTHRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	0/3	5.00E-02	1.30E-01	--	1.30E-01	0/5	1.20E-01	1.35E-01	--	1.35E-01	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL HMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL HMW PAH (ND = DL)	3/3	9.00E-01	2.34E+00	1.83E+00	3.19E+00	5/5	2.16E+00	2.43E+00	2.34E+00	2.45E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL LMW PAH (ND = 0)	3/3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5/5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL LMW PAH (ND = DL)	3/3	9.00E-01	2.34E+00	1.83E+00	3.19E+00	5/5	2.16E+00	2.43E+00	2.34E+00	2.45E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCBS													
PCB 8 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 18 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 66 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 87 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 90 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 101 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 105 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 128 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	2/3	4.90E-03	6.70E-03	6.03E-03	7.70E-03	5/5	4.80E-03	6.40E-03	5.48E-03	6.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 153 (BZ)	2/3	6.50E-03	9.20E-03	7.67E-03	1.00E-02	5/5	8.00E-03	1.20E-02	1.01E-02	1.18E-02	NA	Do Not Reject H0	Does Not Exceed Background
PCB 156 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 170 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 187 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	0/3	6.50E-03	6.50E-03	--	6.50E-03	0/5	6.00E-03	6.50E-03	--	6.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	3/3	0.00E+00	3.18E-02	1.87E-02	4.68E-02	5/5	2.62E-02	3.68E-02	3.12E-02	3.61E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	3/3	4.40E-01	4.68E-01	4.52E-01	4.76E-01	5/5	4.12E-01	4.53E-01	4.41E-01	4.57E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background

Bold = Patapsco River Background Area detected chemical concentration statistically exceeds Pre-Test cencentration.

A) The data presented in the 95% UCLM column represents the recommended exposure point concentration (EPC) for use in the reasonable maximum exposure scenario of the risk assessment. When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect.

TABLE 17
BIOACCUMULATION FACTOR DEVELOPMENT BASED ON LABORATORY BIOACCUMULATION CLAM TISSUE RESULTS

ANALYTE	Coke Point Offshore Area							Patapsco River Background Area						
	Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)				Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)			
				Min	Max	Mean	95% UCLM				Min	Max	Mean	95% UCLM
METALS														
ALUMINUM	5	1.35E+01	1.22E+04	1.02E-03	1.22E-03	1.11E-03	1.18E-03	5	1.47E+01	5.44E+02	1.69E-02	5.37E-02	2.70E-02	4.14E-02
ANTIMONY	5	3.08E-02	1.40E+00	9.29E-03	3.43E-02	2.20E-02	3.15E-02	5	2.46E-02	7.20E-02	2.36E-01	6.39E-01	3.42E-01	5.04E-01
ARSENIC	5	2.50E+00	5.18E+01	4.05E-02	5.60E-02	4.83E-02	5.41E-02	5	2.36E+00	1.30E+00	1.62E+00	2.15E+00	1.82E+00	2.03E+00
CADMIUM	5	3.22E-02	5.00E+00	5.20E-03	8.40E-03	6.44E-03	7.66E-03	5	4.02E-02	4.70E-02	7.23E-01	1.23E+00	8.55E-01	1.06E+00
CHROMIUM	5	4.36E-01	2.59E+02	1.39E-03	2.05E-03	1.68E-03	1.92E-03	5	4.32E-01	1.92E+01	1.41E-02	4.84E-02	2.25E-02	3.64E-02
COBALT	5	3.20E-01	5.13E+01	5.46E-03	6.82E-03	6.24E-03	6.73E-03	5	1.56E-01	8.20E-01	1.59E-01	2.32E-01	1.90E-01	2.21E-01
COPPER	5	2.08E+00	3.76E+02	4.79E-03	5.85E-03	5.53E-03	5.95E-03	5	2.16E+00	4.00E+00	3.75E-01	8.25E-01	5.40E-01	7.14E-01
IRON	5	1.81E+02	9.02E+04	1.82E-03	2.33E-03	2.00E-03	2.19E-03	5	8.21E+01	2.19E+03	3.37E-02	5.02E-02	3.75E-02	4.43E-02
LEAD	5	1.07E+00	8.14E+02	1.07E-03	1.72E-03	1.31E-03	1.55E-03	5	2.62E-01	5.90E+00	2.88E-02	8.64E-02	4.44E-02	6.72E-02
MANGANESE	5	2.26E+00	1.36E+03	1.40E-03	1.91E-03	1.66E-03	1.89E-03	5	1.70E+00	6.92E+01	2.02E-02	3.03E-02	2.46E-02	2.83E-02
MERCURY	0	0.00E+00	0.00E+00	NA	NA	NA	NA	1	1.20E-02	1.40E-02	8.57E-01	8.57E-01	8.57E-01	--
NICKEL	5	3.92E-01	3.96E+01	9.09E-03	1.09E-02	9.90E-03	1.06E-02	5	3.98E-01	1.60E+00	2.00E-01	3.13E-01	2.49E-01	2.90E-01
SELENIUM	5	3.04E-01	6.50E+00	4.00E-02	5.38E-02	4.68E-02	5.19E-02	5	1.92E-01	1.40E-01	9.29E-01	1.79E+00	1.37E+00	1.71E+00
SILVER	5	3.20E-02	2.20E+00	1.23E-02	1.82E-02	1.45E-02	1.67E-02	5	3.74E-02	3.30E-02	7.27E-01	1.39E+00	1.13E+00	1.43E+00
THALLIUM	4	7.00E-03	8.20E-01	4.76E-03	1.46E-02	8.54E-03	1.39E-02	5	3.58E-03	2.20E-02	1.55E-01	1.77E-01	1.63E-01	1.74E-01
TIN	5	2.66E-01	1.01E+02	1.39E-03	4.75E-03	2.63E-03	3.86E-03	2	1.10E-01	2.90E+00	3.79E-02	3.79E-02	3.79E-02	3.79E-02
ZINC	5	1.40E+01	1.60E+03	7.81E-03	9.56E-03	8.78E-03	9.49E-03	5	1.21E+01	2.18E+01	5.00E-01	7.57E-01	5.54E-01	6.62E-01
PAHs														
ACENAPHTHENE	5	7.56E-02	2.80E+00	1.75E-02	3.93E-02	2.70E-02	3.57E-02	0	0	0	NA	NA	NA	NA
ACENAPHTHYLENE	5	5.24E-02	5.60E+00	5.00E-03	1.75E-02	9.36E-03	1.41E-02	0	0	0	NA	NA	NA	NA
ANTHRACENE	5	7.26E-01	1.20E+01	3.33E-02	9.17E-02	6.05E-02	8.24E-02	0	0	0	NA	NA	NA	NA
BENZO(A)ANTHRACENE	5	2.84E+00	2.70E+01	5.56E-02	1.81E-01	1.05E-01	1.49E-01	0	0	0	NA	NA	NA	NA
BENZO(A)PYRENE	5	1.64E+00	2.90E+01	3.79E-02	8.28E-02	5.66E-02	7.31E-02	0	0	0	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	5	1.16E+00	3.50E+01	1.97E-02	5.71E-02	3.33E-02	4.74E-02	0	0	0	NA	NA	NA	NA
BENZO(GHI)PERYLENE	5	2.56E-01	1.50E+01	1.00E-02	2.73E-02	1.71E-02	2.33E-02	0	0	0	NA	NA	NA	NA
CHRYSENE	5	2.96E+00	2.60E+01	8.46E-02	1.50E-01	1.14E-01	1.45E-01	0	0	0	NA	NA	NA	NA
FLUORANTHENE	5	1.46E+01	5.90E+01	1.66E-01	3.39E-01	2.47E-01	3.10E-01	0	0	0	NA	NA	NA	NA
FLUORENE	1	5.00E-02	2.90E+00	1.72E-02	1.72E-02	1.72E-02	--	0	0	0	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	3	5.03E-01	1.40E+01	3.21E-02	4.14E-02	3.60E-02	4.41E-02	0	0	0	NA	NA	NA	NA
NAPHTHALENE	5	3.22E-01	8.30E+01	3.37E-03	4.46E-03	3.88E-03	4.39E-03	0	0	0	NA	NA	NA	NA
PHENANTHRENE	5	8.44E-01	1.50E+01	3.00E-02	8.00E-02	5.63E-02	7.59E-02	0	0	0	NA	NA	NA	NA
PYRENE	5	6.81E+00	3.10E+01	8.71E-03	3.23E-01	2.20E-01	3.45E-01	0	0	0	NA	NA	NA	NA
TOTAL HPAHs (ND=0)	5	1.69E+01	1.82E+02	6.49E-02	1.15E-01	9.27E-02	1.11E-01	0	0	0	NA	NA	NA	NA
TOTAL HPAHs (ND=1/2DL)	5	1.70E+01	1.82E+02	6.56E-02	1.16E-01	9.32E-02	1.12E-01	5	1.04E+03	1.08E+02	6.25E+00	2.08E+01	9.58E+00	1.56E+01
TOTAL HPAHs (ND=DL)	5	1.71E+01	1.82E+02	6.63E-02	1.17E-01	9.37E-02	1.12E-01	5	2.07E+03	1.50E+02	9.00E+00	3.00E+01	1.38E+01	2.25E+01
TOTAL LPAHs (ND=0)	5	1.66E+01	1.85E+02	5.97E-02	1.24E-01	8.99E-02	1.13E-01	0	0	0	NA	NA	NA	NA
TOTAL LPAHs (ND=1/2DL)	5	1.68E+01	1.85E+02	6.09E-02	1.25E-01	9.11E-02	1.14E-01	5	1.04E+03	1.16E+02	5.81E+00	1.94E+01	8.91E+00	1.45E+01
TOTAL LPAHs (ND=DL)	5	1.70E+01	1.85E+02	6.20E-02	1.25E-01	9.23E-02	1.15E-01	5	2.07E+03	1.58E+02	8.53E+00	2.84E+01	1.31E+01	2.13E+01
TOTAL PAHs (ND=0)	5	3.34E+01	3.66E+02	6.23E-02	1.06E-01	9.13E-02	1.09E-01	0	0	0	NA	NA	NA	NA
TOTAL PAHs (ND=1/2DL)	5	3.38E+01	3.67E+02	6.32E-02	1.07E-01	9.21E-02	1.10E-01	5	2.07E+03	2.24E+02	6.02E+00	2.01E+01	9.23E+00	1.50E+01
TOTAL PAHs (ND=DL)	5	3.41E+01	3.67E+02	6.41E-02	1.08E-01	9.30E-02	1.11E-01	5	4.14E+03	3.08E+02	8.76E+00	2.92E+01	1.34E+01	2.19E+01

TABLE 17
BIOACCUMULATION FACTOR DEVELOPMENT BASED ON LABORATORY BIOACCUMULATION CLAM TISSUE RESULTS

ANALYTE	Coke Point Offshore Area							Patapsco River Background Area						
	Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)				Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)			
				Min	Max	Mean	95% UCLM				Min	Max	Mean	95% UCLM
PCBs														
PCB 105 (BZ)	1	1.30E-01	4.80E-03	2.71E+01	2.71E+01	2.71E+01	--	0	0	0	NA	NA	NA	NA
PCB 118 (BZ)	1	1.50E-01	1.40E-02	1.07E+01	1.07E+01	1.07E+01	--	0	0	0	NA	NA	NA	NA
PCB 128 (BZ)	2	1.15E-01	8.00E-03	1.25E+00	2.75E+01	1.44E+01	9.72E+01	0	0	0	NA	NA	NA	NA
PCB 138 (BZ)	2	2.91E-01	1.50E-02	1.47E+00	3.73E+01	1.94E+01	1.33E+02	0	0	0	NA	NA	NA	NA
PCB 153 (BZ)	2	1.53E-01	2.10E-02	7.62E-01	1.38E+01	7.29E+00	4.85E+01	0	0	0	NA	NA	NA	NA
PCB 170 (BZ)	1	2.60E-01	6.60E-03	3.94E+01	3.94E+01	3.94E+01	--	0	0	0	NA	NA	NA	NA
PCB 18 (BZ)	3	1.30E-02	2.00E-02	5.50E-01	7.50E-01	6.50E-01	8.19E-01	0	0	0	NA	NA	NA	NA
PCB 187 (BZ)	1	5.80E-02	7.20E-03	8.06E+00	8.06E+00	8.06E+00	--	0	0	0	NA	NA	NA	NA
PCB 28 (BZ)	5	1.36E-02	2.60E-02	3.19E-01	7.31E-01	5.22E-01	7.02E-01	0	0	0	NA	NA	NA	NA
PCB 52 (BZ)	5	1.38E-02	2.60E-02	3.15E-01	7.69E-01	5.32E-01	7.07E-01	0	0	0	NA	NA	NA	NA
PCB 87 (BZ)	1	7.00E-02	1.00E-02	7.00E+00	7.00E+00	7.00E+00	--	0	0	0	NA	NA	NA	NA
TOTAL PCBs (ND=0)	5	8.38E-01	3.77E-01	9.86E-02	9.95E+00	2.22E+00	6.35E+00	0	0	0	NA	NA	NA	NA
TOTAL PCBs (ND=1/2DL)	5	1.09E+00	3.87E-01	8.41E-01	9.97E+00	2.82E+00	6.63E+00	5	3.78E+02	6.47E+00	5.00E+01	6.95E+01	5.84E+01	6.54E+01
TOTAL PCBs (ND=DL)	5	1.34E+00	3.96E-01	1.55E+00	9.99E+00	3.38E+00	6.90E+00	5	7.56E+02	8.15E+00	7.95E+01	1.10E+02	9.27E+01	1.04E+02

HPAH= high molecular weight PAH
LPAH= Low molecular weight PAH
-- = Frequency of detect too low to calculate 95% UCLM
NA = BAF not available because constituent was not detected in tissue samples
* Number of detections in tissue out of 5.

TABLE 18
BIOACCUMULATION FACTOR DEVELOPMENT BASED ON LABORATORY BIOACCUMULATION WORM TISSUE RESULTS

ANALYTE	Coke Point Offshore Area							Patapsco River Background Area						
	Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)				Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)			
				Min	Max	Mean	95% UCLM				Min	Max	Mean	95% UCLM
METALS														
ALUMINUM	5	2.92E+01	1.22E+04	1.64E-04	3.80E-03	2.40E-03	4.00E-03	5	1.10E+00	5.44E+02	7.54E-04	4.23E-03	2.03E-03	3.32E-03
ANTIMONY	5	2.35E-02	1.40E+00	5.43E-03	2.93E-02	1.68E-02	2.65E-02	5	5.20E-03	7.20E-02	5.83E-02	8.47E-02	7.22E-02	8.13E-02
ARSENIC	5	1.88E+00	5.18E+01	3.47E-02	3.86E-02	3.63E-02	3.83E-02	5	2.34E+00	1.30E+00	1.69E+00	1.92E+00	1.80E+00	1.88E+00
BERYLLIUM	1	3.90E-03	1.20E+00	3.25E-03	3.25E-03	3.25E-03	--	0	0	0	NA	NA	NA	NA
CADMIUM	5	3.16E-02	5.00E+00	4.60E-03	7.80E-03	6.32E-03	7.76E-03	5	3.78E-02	4.70E-02	6.60E-01	9.36E-01	8.04E-01	9.22E-01
CHROMIUM	5	7.66E-01	2.59E+02	6.56E-04	4.63E-03	2.96E-03	4.68E-03	5	3.16E-01	1.92E+01	8.85E-03	4.11E-02	1.65E-02	2.96E-02
COBALT	5	3.92E-01	5.13E+01	4.87E-03	9.55E-03	7.64E-03	9.67E-03	5	9.06E-02	8.20E-01	1.00E-01	1.20E-01	1.10E-01	1.17E-01
COPPER	5	2.20E+00	3.76E+02	3.46E-03	7.71E-03	5.85E-03	7.75E-03	5	1.30E+00	4.00E+00	3.00E-01	3.50E-01	3.25E-01	3.42E-01
IRON	5	2.72E+02	9.02E+04	7.94E-04	4.35E-03	3.01E-03	4.63E-03	5	6.30E+01	2.19E+03	2.76E-02	3.05E-02	2.88E-02	2.98E-02
LEAD	5	1.79E+00	8.14E+02	2.46E-04	3.32E-03	2.19E-03	3.62E-03	5	2.73E-01	5.90E+00	1.29E-02	1.63E-01	4.63E-02	1.08E-01
MANGANESE	5	5.06E+00	1.36E+03	1.69E-03	5.37E-03	3.72E-03	5.47E-03	5	1.07E+00	6.92E+01	6.50E-03	2.31E-02	1.54E-02	2.11E-02
MERCURY	5	1.98E-02	1.60E+00	1.00E-02	1.44E-02	1.24E-02	1.43E-02	5	2.46E-02	1.40E-02	1.57E+00	1.93E+00	1.76E+00	1.88E+00
NICKEL	5	3.76E-01	3.96E+01	6.57E-03	1.11E-02	9.49E-03	1.14E-02	5	2.38E-01	1.60E+00	1.38E-01	1.69E-01	1.49E-01	1.60E-01
SELENIUM	5	3.12E-01	6.50E+00	4.31E-02	5.54E-02	4.80E-02	5.24E-02	5	3.20E-01	1.40E-01	2.00E+00	2.86E+00	2.29E+00	2.65E+00
SILVER	5	3.54E-02	2.20E+00	1.00E-02	2.14E-02	1.61E-02	2.02E-02	5	2.38E-02	3.30E-02	5.15E-01	8.18E-01	7.21E-01	8.36E-01
THALLIUM	5	7.22E-03	8.20E-01	3.78E-03	1.46E-02	8.80E-03	1.35E-02	0	0	0	NA	NA	NA	NA
TIN	4	5.35E-01	1.01E+02	1.88E-03	7.92E-03	5.30E-03	8.48E-03	0	0	0	NA	NA	NA	NA
ZINC	5	2.85E+01	1.60E+03	6.38E-03	2.35E-02	1.78E-02	2.45E-02	3	2.61E+01	1.78E+01	4.33E-01	2.74E+00	1.47E+00	3.44E+00
PAHs														
1-METHYLNAPHTHALENE	2	6.00E-02	1.40E+00	2.29E-02	6.29E-02	4.29E-02	1.69E-01	0	0	0	NA	NA	NA	NA
2-METHYLNAPHTHALENE	1	9.80E-02	2.80E+00	3.50E-02	3.50E-02	3.50E-02	--	0	0	0	NA	NA	NA	NA
ACENAPHTHENE	5	1.82E-01	2.80E+00	5.00E-02	1.00E-01	6.50E-02	8.48E-02	0	0	0	NA	NA	NA	NA
ACENAPHTHYLENE	4	1.54E-01	5.60E+00	1.20E-02	5.54E-02	2.74E-02	5.02E-02	0	0	0	NA	NA	NA	NA
ANTHRACENE	5	3.62E-01	1.20E+01	2.33E-02	4.08E-02	3.02E-02	3.76E-02	0	0	0	NA	NA	NA	NA
BENZO(A)ANTHRACENE	5	9.12E-01	2.70E+01	2.33E-02	4.07E-02	3.38E-02	4.10E-02	0	0	0	NA	NA	NA	NA
BENZO(A)PYRENE	5	1.25E+00	2.90E+01	3.28E-02	5.52E-02	4.31E-02	5.12E-02	0	0	0	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	5	4.48E-01	3.50E+01	7.71E-03	1.80E-02	1.28E-02	1.64E-02	0	0	0	NA	NA	NA	NA
BENZO(GHI)PERYLENE	5	1.45E-01	1.50E+01	4.40E-03	1.60E-02	9.68E-03	1.36E-02	0	0	0	NA	NA	NA	NA
CHRYSENE	5	1.74E+00	2.60E+01	5.00E-02	8.08E-02	6.69E-02	8.03E-02	0	0	0	NA	NA	NA	NA
DIBENZ(A,H)ANTHRACENE	4	7.48E-01	4.90E+00	1.35E-01	1.84E-01	1.53E-01	1.78E-01	0	0	0	NA	NA	NA	NA
FLUORANTHENE	5	4.64E+00	5.90E+01	6.27E-02	9.83E-02	7.86E-02	9.39E-02	0	0	0	NA	NA	NA	NA
FLUORENE	1	8.10E-02	2.90E+00	2.79E-02	2.79E-02	2.79E-02	--	0	0	0	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	5	6.86E-01	1.40E+01	4.07E-02	6.21E-02	4.90E-02	5.66E-02	0	0	0	NA	NA	NA	NA
NAPHTHALENE	5	8.78E-01	8.30E+01	1.06E-03	1.69E-02	1.06E-02	1.75E-02	0	0	0	NA	NA	NA	NA
PHENANTHRENE	5	5.16E-01	1.50E+01	2.40E-02	4.47E-02	3.44E-02	4.17E-02	0	0	0	NA	NA	NA	NA
PYRENE	5	2.14E+00	3.10E+01	5.16E-02	8.71E-02	6.90E-02	8.45E-02	0	0	0	NA	NA	NA	NA
TOTAL HPAHs (ND=0)	5	8.28E+00	1.82E+02	3.09E-02	5.71E-02	4.55E-02	5.55E-02	0	0	0	NA	NA	NA	NA
TOTAL HPAHs (ND=1/2DL)	5	8.31E+00	1.82E+02	3.16E-02	5.70E-02	4.56E-02	5.53E-02	5	1.17E+00	1.08E-01	1.00E+01	1.13E+01	1.08E+01	1.13E+01
TOTAL HPAHs (ND=DL)	5	8.33E+00	1.82E+02	3.22E-02	5.69E-02	4.57E-02	5.52E-02	5	2.34E+00	1.50E-01	1.44E+01	1.62E+01	1.56E+01	1.63E+01
TOTAL LPAHs (ND=0)	5	6.76E+00	1.85E+02	2.65E-02	4.78E-02	3.66E-02	4.56E-02	0	0	0	NA	NA	NA	NA
TOTAL LPAHs (ND=1/2DL)	5	7.10E+00	1.85E+02	2.85E-02	4.81E-02	3.85E-02	4.70E-02	5	1.17E+00	1.16E-01	9.29E+00	1.05E+01	1.01E+01	1.05E+01
TOTAL LPAHs (ND=DL)	5	7.44E+00	1.85E+02	3.04E-02	5.08E-02	4.03E-02	4.86E-02	5	2.34E+00	1.58E-01	1.37E+01	1.54E+01	1.48E+01	1.55E+01
TOTAL PAHs (ND=0)	5	1.50E+01	3.66E+02	2.87E-02	5.11E-02	4.11E-02	5.02E-02	0	0	0	NA	NA	NA	NA
TOTAL PAHs (ND=1/2DL)	5	1.54E+01	3.67E+02	3.00E-02	5.25E-02	4.20E-02	5.10E-02	5	2.34E+00	2.24E-01	9.63E+00	1.08E+01	1.04E+01	1.09E+01
TOTAL PAHs (ND=DL)	5	1.58E+01	3.67E+02	3.13E-02	5.39E-02	4.30E-02	5.17E-02	5	4.68E+00	3.08E-01	1.40E+01	1.58E+01	1.52E+01	1.59E+01

TABLE 18
BIOACCUMULATION FACTOR DEVELOPMENT BASED ON LABORATORY BIOACCUMULATION WORM TISSUE RESULTS

ANALYTE	Coke Point Offshore Area							Patapsco River Background Area						
	Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)				Number of Detects in Tissue*	Mean Tissue Concentration (mg/kg wet weight)	Mean Sediment Concentration (mg/kg dry weight)	BAF (kg sediment dry weight/ kg tissue wet weight)			
				Min	Max	Mean	95% UCLM				Min	Max	Mean	95% UCLM
PCBs														
PCB 118 (BZ)	3	5.93E-03	1.40E-02	3.93E-01	4.71E-01	4.24E-01	4.94E-01	0	0	0	NA	NA	NA	NA
PCB 138 (BZ)	5	1.30E-02	1.50E-02	7.33E-01	1.00E+00	8.67E-01	9.67E-01	5	5.48E-03	3.30E-01	1.45E+01	1.94E+01	1.66E+01	1.89E+01
PCB 153 (BZ)	5	2.04E-02	2.10E-02	9.05E-01	1.05E+00	9.71E-01	1.02E+00	5	1.01E-02	2.40E-01	3.33E+01	5.00E+01	4.23E+01	4.94E+01
PCB 18 (BZ)	5	1.66E-02	2.00E-02	7.00E-01	1.00E+00	8.30E-01	9.34E-01	0	0	0	NA	NA	NA	NA
PCB 187 (BZ)	4	7.73E-03	7.20E-03	1.04E+00	1.11E+00	1.07E+00	1.11E+00	0	0	0	NA	NA	NA	NA
PCB 28 (BZ)	5	1.18E-02	2.60E-02	3.77E-01	5.77E-01	4.52E-01	5.33E-01	0	0	0	NA	NA	NA	NA
PCB 44 (BZ)	5	1.30E-02	2.10E-02	5.24E-01	7.14E-01	6.19E-01	6.91E-01	0	0	0	NA	NA	NA	NA
PCB 52 (BZ)	5	2.96E-02	2.60E-02	1.00E+00	1.27E+00	1.14E+00	1.23E+00	0	0	0	NA	NA	NA	NA
TOTAL PCBs (ND=0)	5	2.68E-01	3.77E-01	5.86E-01	7.95E-01	7.10E-01	7.95E-01	5	3.12E-02	4.79E+00	5.47E+00	7.68E+00	6.52E+00	7.52E+00
TOTAL PCBs (ND=1/2DL)	5	3.80E-01	3.87E-01	8.82E-01	1.07E+00	9.83E-01	1.05E+00	5	2.36E-01	6.47E+00	3.40E+01	3.78E+01	3.65E+01	3.80E+01
TOTAL PCBs (ND=DL)	5	4.93E-01	3.96E-01	1.16E+00	1.32E+00	1.24E+00	1.30E+00	5	4.41E-01	8.15E+00	5.05E+01	5.55E+01	5.41E+01	5.60E+01

HPAH= high molecular weight PAH
LPAH= Low molecular weight PAH
-- = Frequency of detect too low to calculate 95% UCLM
NA = BAF not available because constituent was not detected in tissue samples
* Number of detections in tissue out of 5.

TABLE 19
VALIDATED RESULTS FROM COKE POINT FIELD EFFORTS: FISH TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Whole Body Fish Tissue (mg/kg wet wt.)										Fillet Fish Tissue (mg/kg wet wt.)									
		CP-MOAM-WB-A		CP-MOAM-WB-B		CP-MOAM-WB-C		CP-MOAM-WB-D		CP-MOAM-WB-E		CP-MOAM-FT-A		CP-MOAM-FT-B		CP-MOAM-FT-C		CP-MOAM-FT-D		CP-MOAM-FT-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																					
PERCENT LIPIDS	--	4.00E+00		3.60E+00		2.60E+00		3.10E+00		4.30E+00		1.10E+00		2.40E+00		9.40E-01		8.00E-01		1.20E+00	
METALS																					
ALUMINUM	--	8.30E+00		4.70E+00		3.05E+01		5.60E+00		3.22E+01		1.90E+00	J	1.30E+00	J	1.60E+00	J	2.00E+00	J	6.70E-01	J
ANTIMONY	--	1.90E-02	J	1.40E-02	J	8.30E-02	J	2.50E-02	J	2.10E-02	J	1.40E-02	J	1.20E-02	J	1.10E-02	J	8.60E-03	J	4.60E-03	J
ARSENIC	--	7.00E-01		5.10E-01		5.00E-01		6.40E-01		5.70E-01		4.80E-01		3.20E-01		3.90E-01		3.80E-01		3.70E-01	
Speciation (Inorganic As)	--	9.80E-02		3.10E-02		--		--		--		0.00E+00	U	0.00E+00	U	--		--		--	
Speciation (As III)	--	9.60E-02	L	3.70E-02	L	--		--		--		0.00E+00	UL	0.00E+00	UL	--		--		--	
Speciation (As V)	--	0.00E+00	L	0.00E+00	L	--		--		--		0.00E+00	UL	0.00E+00	UL	--		--		--	
BERYLLIUM	--	8.30E-02	U	9.40E-02	U	8.80E-02	U	8.60E-02	U	8.60E-02	U	9.60E-02	U	9.20E-02	U	9.30E-02	U	9.20E-02	U	8.50E-02	U
CADMIUM	--	8.30E-02	U	9.40E-02	U	8.80E-02	U	8.60E-02	U	8.60E-02	U	9.60E-02	U	9.20E-02	U	9.30E-02	U	9.20E-02	U	8.50E-02	U
CHROMIUM	--	1.40E-01	J	1.60E-01	J	2.50E-01		1.10E-01	B	3.60E-01		7.20E-02	B	1.80E-01	U	1.00E-02	B	1.80E-01	U	1.70E-01	U
COBALT	--	6.70E-02		5.40E-02		9.10E-02		4.60E-02		1.10E-01		3.00E-02	J	2.90E-02	J	1.80E-02	J	3.10E-02	J	1.40E-02	J
COPPER	--	1.51E+01		2.25E+01		2.57E+01		3.41E+01		2.23E+01		4.50E+00		9.90E-01		2.10E+00		1.20E+00		7.50E-01	
IRON	--	8.93E+01		4.55E+01		1.42E+02		5.89E+01		1.25E+02		6.50E+00		4.70E+00		4.30E+00	J	7.80E+00		3.60E+00	J
LEAD	--	7.10E-01		3.70E-01		7.00E-01		4.70E-01		7.80E-01		2.20E-01		1.60E-01		2.00E-01		2.60E-01		8.20E-02	J
MANGANESE	--	1.00E+01		5.40E+00		1.37E+01		2.90E+00		1.47E+01		3.10E+00		2.30E+00		1.90E+00		4.00E+00		1.40E+00	
MERCURY	--	2.20E-02	J	2.80E-02	J	3.30E-02		3.40E-02		3.10E-02	J	3.70E-02		4.70E-02		5.60E-02		5.40E-02		4.80E-02	
NICKEL	--	8.60E-02		7.40E-02	J	1.30E-01		6.90E-02	J	1.50E-01		5.10E-02	J	6.20E-02	J	3.50E-02	J	5.70E-02	J	3.10E-02	J
SELENIUM	--	1.60E+00		1.50E+00		1.50E+00		1.80E+00		1.40E+00		7.80E-01		8.70E-01		9.70E-01		7.60E-01		8.50E-01	
SILVER	--	2.10E-01		2.30E-01		3.40E-01		4.90E-01		2.50E-01		4.20E-02	J	9.20E-02	U	1.80E-02	J	9.20E-02	U	8.50E-02	U
THALLIUM	--	9.50E-03	J	5.40E-03	J	8.80E-02	U	8.50E-02	U	8.60E-02	U	9.60E-02	U	9.20E-02	U	9.30E-02	U	9.20E-02	U	8.50E-02	U
TIN	--	2.80E-01	J	1.80E-01	J	2.70E-01	J	1.60E-01	J	2.20E-01	J	1.40E-01	J	4.60E-01	U	1.10E-01	J	1.10E-01	J	4.20E-01	U
ZINC	--	2.90E+01	J	2.86E+01	J	2.48E+01	J	2.87E+01		3.21E+01	J	1.11E+01	J	1.36E+01	J	1.10E+01	J	1.18E+01	J	9.40E+00	J
PAHS																					
1-METHYLNAPHTHALENE	Low	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
2-METHYLNAPHTHALENE	Low	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	5.00E-03	J	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
ACENAPHTHENE	Low	1.10E-02	J	6.40E-03	J	1.60E-02	U	7.60E-03	J	6.20E-03	J	2.70E-02	U	3.60E-03	J	1.60E-02	U	1.60E-02	U	1.60E-02	U
ACENAPHTHYLENE	Low	9.00E-03	J	6.60E-03	J	4.50E-03	J	8.60E-03	J	6.70E-03	J	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
ANTHRACENE	Low	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(A)ANTHRACENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(A)PYRENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(B)FLUORANTHENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(G,H,I)PERYLENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.40E-04	J	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(K)FLUORANTHENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
CHRYSENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
DIBENZO(A,H)ANTHRACENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
FLUORANTHENE	Low	5.90E-02		3.40E-02		1.60E-02	U	3.40E-02		3.40E-02		2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.40E-02	J
FLUORENE	Low	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	7.20E-03	J	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
INDENO(1,2,3-CD)PYRENE	High	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	3.20E-03	J	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
NAPHTHALENE	Low	1.90E-02		8.00E-03	U	1.60E-02	U	1.60E-02	U	1.90E-02		2.70E-02	U	1.30E-02	J	1.60E-02	U	4.10E-03	J	1.60E-02	U
PHENANTHRENE	Low	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	1.00E-02		2.70E-02	U	5.80E-03	J	1.60E-02	U	4.30E-03	J	1.60E-02	U
PYRENE	High	5.40E-03	J	8.00E-03	U	1.60E-02	U	1.60E-02	U	8.00E-03	U	2.70E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
PCBS																					
PCB 8 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 18 (BZ)	--	5.90E-03		4.00E-03		3.50E-03		4.40E-03		3.10E-03		1.40E-03	J	1.80E-03	J	9.50E-04	J	2.00E-03	U	1.70E-03	J
PCB 28 (BZ)	--	7.30E-03	J	5.00E-03	J	5.00E-03	J	5.50E-03	J	4.30E-03	J	1.60E-03	J	2.30E-03	J	1.30E-03	J	1.10E-03	J	2.00E-03	J
PCB 44 (BZ)	--	1.20E-02		9.20E-03	J	8.80E-03		1.00E-02		7.60E-03		2.60E-03		3.80E-03	J	1.70E-03	J	2.00E-03		2.30E-03	
PCB 49 (BZ)	--	1.90E-02		1.50E-02		1.30E-02		1.60E-02		1.20E-02		4.10E-03		6.10E-03		1.50E-03	J	3.30E-03		4.10E-03	
PCB 52 (BZ)	--	2.20E-02		1.70E-02		1.50E-02		1.90E-02		1.40E-02		4.90E-03		6.90E-03		3.20E-03	J	3.80E-03		4.60E-03	
PCB 66 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U

TABLE 19
VALIDATED RESULTS FROM COKE POINT FIELD EFFORTS: FISH TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Whole Body Fish Tissue (mg/kg wet wt.)										Fillet Fish Tissue (mg/kg wet wt.)									
		CP-MOAM-WB-A		CP-MOAM-WB-B		CP-MOAM-WB-C		CP-MOAM-WB-D		CP-MOAM-WB-E		CP-MOAM-FT-A		CP-MOAM-FT-B		CP-MOAM-FT-C		CP-MOAM-FT-D		CP-MOAM-FT-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCB 77 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 87 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 90 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 101 (BZ)	--	2.60E-02		2.20E-02		2.10E-02		2.60E-02		1.90E-02		6.30E-03		9.10E-03		4.20E-03		6.80E-03		5.50E-03	
PCB 105 (BZ)	--	7.50E-03		6.90E-03	J	4.10E-03	J	7.80E-03	J	5.90E-03	J	1.90E-03	J	2.60E-03		1.10E-03	J	2.00E-03	J	1.80E-03	J
PCB 118 (BZ)	--	1.20E-02	J	1.10E-02	J	1.00E-02	J	1.20E-02	J	9.50E-03	J	3.00E-03	J	4.20E-03	J	2.50E-03	J	3.50E-03	J	3.00E-03	J
PCB 126 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 128 (BZ)	--	1.00E-02		8.40E-03		8.60E-03		9.70E-03		7.90E-03		2.30E-03		3.50E-03		1.60E-03	J	2.80E-03		2.60E-03	
PCB 138 (BZ)	--	2.90E-02	J	2.70E-02	J	2.50E-02	J	4.50E-02	J	2.50E-02	J	7.70E-03	J	1.60E-02	J	8.60E-03	J	1.50E-02	J	1.10E-02	J
PCB 153 (BZ)	--	5.50E-02		5.00E-02		5.10E-02		5.90E-02		4.70E-02		1.50E-02		2.10E-02		1.20E-02		2.00E-02		1.60E-02	
PCB 156 (BZ)	--	5.10E-03	J	4.60E-03	J	5.00E-03	J	5.70E-03	J	4.30E-03	J	1.30E-03	J	1.80E-03	J	8.80E-04	J	1.70E-03	J	1.40E-03	J
PCB 169 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 170 (BZ)	--	1.80E-02		1.60E-02		1.80E-02		2.10E-02		1.60E-02		5.50E-03	J	7.30E-03		3.70E-03	J	7.40E-03		6.30E-03	
PCB 180 (BZ)	--	2.20E-02	J	2.10E-02	J	2.30E-02	J	1.90E-02	J	1.40E-02	J	6.30E-03	J	6.30E-03	J	3.20E-03	J	6.30E-03	J	5.60E-03	J
PCB 183 (BZ)	--	7.40E-03	J	6.40E-03	J	6.50E-03	J	8.00E-03	J	6.50E-03	J	3.10E-03	J	4.20E-03	J	1.70E-03	J	2.70E-03	J	2.50E-03	J
PCB 184 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 187 (BZ)	--	2.90E-02		2.60E-02		2.60E-02		3.00E-02		2.60E-02		8.20E-03		1.10E-02		5.50E-03		1.10E-02		8.50E-03	
PCB 195 (BZ)	--	2.10E-03		1.90E-03	J	2.40E-03		2.60E-03		1.90E-03	J	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 206 (BZ)	--	1.30E-02		1.30E-02		1.70E-02		2.10E-02		1.30E-02		6.40E-03		6.30E-03		3.20E-03		7.30E-03		4.60E-03	
PCB 209 (BZ)	--	1.10E-02		1.10E-02		1.40E-02		2.00E-02		1.10E-02		6.70E-03		6.00E-03		3.40E-03		6.70E-03		4.40E-03	

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 20
VALIDATED RESULTS FROM COKE POINT FIELD EFFORTS: CRAB TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Crab Tissue: Meat (mg/kg wet wt.)										Crab Tissue: Mustard (mg/kg wet wt.)									
		CP-CASA-MT-A		CP-CASA-MT-B		CP-CASA-MT-C		CP-CASA-MT-D		CP-CASA-MT-E		CP-CASA-MU-A		CP-CASA-MU-B		CP-CASA-MU-C		CP-CASA-MU-D		CP-CASA-MU-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																					
PERCENT LIPIDS	--	5.20E-01		6.10E-01		2.20E-01		7.90E-01		4.30E-01		7.40E+00		7.90E+00		5.40E+00		7.60E+00		5.40E+00	
METALS																					
ALUMINUM	--	3.10E+00		2.40E+00	J	3.60E+00		3.50E+00		3.20E+00		1.23E+01		9.40E+00		8.20E+00		2.29E+01		1.40E+01	
ANTIMONY	--	2.70E-02	B	1.90E-02	B	1.50E-02	B	1.30E-02	B	1.40E-02	B	9.20E-02	B	7.20E-02	B	4.90E-02	B	4.80E-02	B	3.00E-02	B
ARSENIC	--	7.60E-01		8.40E-01		1.00E+00		8.40E-01		9.10E-01		2.30E+00		2.10E+00		2.00E+00		2.10E+00		1.20E+00	
Speciation (Inorganic As)	--	1.90E-02		2.10E-02		--		--		--		6.50E-02		6.00E-02		--		--		--	
Speciation (As III)	--	1.50E-02	L	1.50E-02	L	--		--		--		3.90E-02	L	3.20E-02	L	--		--		--	
Speciation (As V)	--	0.00E+00	L	0.00E+00	L	--		--		--		2.60E-02	L	2.70E-02	L	--		--		--	
BERYLLIUM	--	9.10E-02	U	9.20E-02	U	8.90E-02	U	7.60E-02	U	9.30E-02	U	9.30E-02	U	8.40E-02	U	9.70E-02	U	8.00E-02	U	7.20E-02	U
CADMIUM	--	2.20E-02	J	3.40E-02	J	4.00E-02	J	3.30E-02	J	5.00E-02	J	5.10E-01		2.90E-01		6.30E-01		3.90E-01		5.70E-01	
CHROMIUM	--	5.50E-02	B	4.90E-02	B	1.80E-01	U	1.50E-01	U	5.60E-02	B	4.30E-01		3.60E-01		2.70E-01		3.30E-01		8.90E-01	
COBALT	--	4.40E-02	J	6.00E-02		3.50E-02	J	5.00E-02		4.30E-02	J	3.80E-01		4.80E-01		2.90E-01		3.50E-01		2.90E-01	
COPPER	--	3.60E+00		4.30E+00		5.50E+00		3.80E+00		5.80E+00		1.50E+01		1.59E+01		2.40E+01		1.67E+01		4.16E+01	
IRON	--	2.11E+01		1.69E+01		2.97E+01		2.06E+01		2.37E+01		8.76E+01		9.95E+01		8.44E+01		1.39E+02		9.71E+01	
LEAD	--	5.60E-02	J	4.70E-02	J	6.70E-02	J	6.80E-02	J	6.00E-02	J	6.20E-01		2.80E-01		3.20E-01		3.10E-01		3.70E-01	
MANGANESE	--	1.80E+00		4.40E+00		2.70E+00		1.04E+01		2.00E+00		7.40E+00		1.09E+01		9.80E+00		1.32E+01		1.38E+01	
MERCURY	--	1.30E-02	J	1.40E-02	J	2.20E-02	J	1.40E-02	J	1.70E-02	J	3.30E-02	U	3.30E-02	U	1.20E-02	J	3.30E-02	U	3.30E-02	U
NICKEL	--	7.20E-02	J	9.40E-02		6.30E-02	J	8.10E-02		9.50E-02		5.60E-01		6.30E-01		3.90E-01		5.10E-01		4.60E-01	
SELENIUM	--	7.80E-01		8.00E-01		1.00E+00		7.70E-01		7.60E-01		1.30E+00		1.30E+00		1.40E+00		1.20E+00		1.10E+00	
SILVER	--	1.10E-01		1.20E-01		2.10E-01		1.40E-01		2.40E-01		3.80E-01		3.90E-01		7.60E-01		4.40E-01		8.90E-01	
THALLIUM	--	9.10E-02	U	9.20E-02	U	8.90E-02	U	7.60E-02	U	9.30E-02	U	2.20E-03	J	2.30E-03	J	9.70E-02	U	6.90E-03	J	7.20E-02	U
TIN	--	4.60E-01	U	4.60E-01	U	4.40E-01	U	3.80E-01	U	4.60E-01	U	2.50E-01	J	1.50E-01	J	1.60E-01	J	1.20E-01	J	3.60E-01	U
ZINC	--	4.06E+01		3.58E+01		4.41E+01		3.96E+01		4.43E+01		5.27E+01		5.29E+01		4.19E+01		5.15E+01		3.06E+01	
PAHS																					
1-METHYLNAPHTHALENE	Low	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
2-METHYLNAPHTHALENE	Low	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	7.60E-03	J	2.70E-02	U	1.50E-02	J
ACENAPHTHENE	Low	5.10E-03	J	2.70E-02	U	7.00E-03	J	2.70E-02	U	1.60E-02	U	1.60E-02	L	1.20E-02	J	3.30E-02	J	2.30E-02	J	3.10E-02	J
ACENAPHTHYLENE	Low	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	3.40E-03	J	--	R	7.40E-03	J	1.00E-02	J	9.10E-03	J	2.10E-02	J
ANTHRACENE	Low	4.10E-03	J	2.70E-02	U	1.60E-02	U	2.70E-02	U	9.00E-03	J	--	R	4.00E-02	U	8.40E-03	J	2.70E-02	U	1.50E-02	J
BENZO(A)ANTHRACENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	2.70E-02	J	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
BENZO(A)PYRENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	2.60E-02	J	2.70E-02	U	4.00E-02	U
BENZO(B)FLUORANTHENE	High	1.40E-02	J	2.70E-02	U	1.60E-02	U	2.70E-02	U	2.10E-02	J	--	R	4.00E-02	U	2.50E-02	J	2.70E-02	U	7.70E-02	J
BENZO(G,H,I)PERYLENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
BENZO(K)FLUORANTHENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	2.10E-02	J	2.70E-02	U	4.00E-02	U
CHRYSENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.10E-02	J	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
DIBENZO(A,H)ANTHRACENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
FLUORANTHENE	Low	3.90E-02		2.70E-02	U	8.80E-03	J	2.70E-02	U	6.10E-02		--	R	6.80E-02		1.70E-01		9.50E-02		2.00E-01	
FLUORENE	Low	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	8.30E-03	J	2.70E-02	U	9.40E-03	J
INDENO(1,2,3-CD)PYRENE	High	1.60E-02	U	2.70E-02	U	1.60E-02	U	2.70E-02	U	1.60E-02	U	--	R	4.00E-02	U	4.00E-02	U	2.70E-02	U	4.00E-02	U
NAPHTHALENE	Low	3.50E-03	J	2.70E-02	U	5.30E-03	J	6.10E-03	J	1.60E-02	U	2.70E-02	L	2.30E-02	J	5.90E-02		2.60E-02	J	5.80E-02	
PHENANTHRENE	Low	1.30E-02	J	2.70E-02	U	4.20E-03	J	2.70E-02	U	6.30E-03	J	--	R	4.00E-02	U	2.10E-02	J	1.90E-02	J	2.90E-02	J

TABLE 20
VALIDATED RESULTS FROM COKE POINT FIELD EFFORTS: CRAB TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Crab Tissue: Meat (mg/kg wet wt.)										Crab Tissue: Mustard (mg/kg wet wt.)									
		CP-CASA-MT-A		CP-CASA-MT-B		CP-CASA-MT-C		CP-CASA-MT-D		CP-CASA-MT-E		CP-CASA-MU-A		CP-CASA-MU-B		CP-CASA-MU-C		CP-CASA-MU-D		CP-CASA-MU-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PYRENE	High	8.70E-03	J	2.70E-02	U	1.60E-02	U	2.70E-02	U	3.30E-02	J	--	R	3.60E-02	J	8.80E-02	J	3.20E-02		1.10E-01	J
PCBS																					
PCB 8 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 18 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 28 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.70E-03	J	9.00E-03	J	6.10E-03	J	6.80E-03	J	6.90E-03	J
PCB 44 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	1.30E-03	J	1.00E-02	U
PCB 49 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.10E-02		2.00E-02		2.10E-02		2.00E-03	U	2.70E-02	L
PCB 52 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 66 (BZ)	--	2.00E-03	U	1.20E-03	J	1.20E-03	J	1.00E-03	J	2.00E-03	U	2.50E-02		2.50E-02		1.60E-02	J	2.10E-02		1.90E-02	
PCB 77 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 87 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 90 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 101 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	1.10E-03	J	2.10E-03	J	3.80E-03	J	8.10E-03	J	3.00E-03	J	4.50E-03	J
PCB 105 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	1.10E-02		1.10E-02		1.00E-02		8.60E-03	J	1.20E-02	
PCB 118 (BZ)	--	2.00E-03	U	2.00E-03	U	1.50E-03	J	9.10E-04	J	1.60E-03	J	1.90E-02	J	2.00E-02	J	2.00E-02	J	1.40E-02	J	2.20E-02	J
PCB 126 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 128 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	6.90E-03		6.70E-03		7.80E-03	J	5.40E-03		9.10E-03	J
PCB 138 (BZ)	--	1.60E-03	J	1.60E-03	J	2.70E-03	J	1.70E-03	J	3.20E-03	J	3.60E-02	J	3.50E-02	J	4.10E-02	J	2.50E-02	J	4.50E-02	J
PCB 153 (BZ)	--	2.70E-03		3.00E-03		6.60E-03		3.80E-03	J	6.70E-03		7.60E-02		7.70E-02		9.30E-02		5.10E-02		1.10E-01	
PCB 156 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.60E-03	J	4.80E-03	J	5.70E-03	J	3.60E-03	J	6.00E-03	J
PCB 169 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 170 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	1.40E-02	J	1.50E-02		1.70E-02	J	1.20E-02	J	1.90E-02	
PCB 180 (BZ)	--	2.00E-03	U	2.00E-03	U	1.50E-03	J	9.70E-04	J	1.70E-03	J	2.30E-02	J	2.40E-02	J	2.80E-02	J	1.70E-02	J	3.50E-02	J
PCB 183 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.30E-04	J	8.50E-03	J	7.40E-03	J	9.40E-03	J	5.20E-03	J	1.10E-02	J
PCB 184 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	2.00E-03	U	1.00E-02	U
PCB 187 (BZ)	--	2.00E-03	U	2.00E-03	U	1.90E-03	J	2.00E-03	U	1.80E-03	J	2.20E-02		2.20E-02		3.00E-02		1.70E-02		3.40E-02	
PCB 195 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.00E-03	U	4.00E-03	U	8.00E-03	U	1.30E-03	J	1.00E-02	U
PCB 206 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.10E-03		8.90E-03		1.00E-02		8.80E-03		1.30E-02	
PCB 209 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	9.30E-04	J	1.10E-03	J	9.20E-03		9.90E-03		1.00E-02		1.20E-02		1.30E-02	

U = Chemical was analyzed for, but not detected.
J = The value is an estimated quantity.
B = The analyte is found in the associated method blank as well as in the sample.
K = The reported value may be biased high.
L = The reported value may be biased low.
R = The datum was rejected.
-- = Value was rejected due to low surrogate recovery.
Full suites of metals (excluding vanadium), PAHs, and PCBs in the tissues were analyzed. Where qualified with a "U", indicating the chemical was analyzed for but not detected, the reporting limit is presented in the result column.

TABLE 21
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND FIELD EFFORTS: FISH TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Whole Body Fish Tissue (mg/kg wet wt.)										Fillet Fish Tissue (mg/kgwet wt.)									
		PR-MOAM-WB-A		PR-MOAM-WB-B		PR-MOAM-WB-C		PR-MOAM-WB-D		PR-MOAM-WB-E		PR-MOAM-FT-A		PR-MOAM-FT-B		PR-MOAM-FT-C		PR-MOAM-FT-D		PR-MOAM-FT-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																					
PERCENT LIPIDS	--	4.10E+00		5.80E+00		4.60E+00		4.50E+00		4.40E+00		1.70E+00		2.20E+00		2.00E+00		5.00E+00		1.30E+00	
METALS																					
ALUMINUM	--	9.90E+00		5.63E+01		8.36E+01		3.54E+01		4.50E+00		9.10E-01	J	5.60E-01	J	6.20E-01	J	3.90E-01	J	9.80E-01	J
ANTIMONY	--	6.90E-02	J	3.50E-02	J	2.20E-02	J	1.30E-02	J	1.20E-02	J	1.40E-02	J	1.50E-02	J	8.60E-02	J	2.30E-02	J	2.10E-02	J
ARSENIC	--	5.10E-01		7.30E-01		8.10E-01		7.60E-01		6.30E-01		3.60E-01		4.60E-01		5.70E-01		4.90E-01		5.40E-01	
Speciation (Inorganic As)	--	1.90E-02		5.60E-02		--		--		--		4.00E-03	J	0.00E+00	U	--		--		--	
Speciation (As III)	--	1.10E-02	L	4.10E-02	L	--		--		--		0.00E+00	UL	0.00E+00	UL	--		--		--	
Speciation (As V)	--	0.00E+00	L	1.40E-02	L	--		--		--		0.00E+00	L	0.00E+00	UL	--		--		--	
BERYLLIUM	--	8.10E-02	U	1.00E-01	U	9.10E-02	U	8.50E-02	U	9.80E-02	U	6.90E-02	U	9.10E-02	U	9.30E-02	U	8.20E-02	U	9.30E-02	U
CADMIUM	--	8.10E-02	U	1.00E-01	U	9.10E-02	U	8.50E-02	U	9.80E-02	U	6.90E-02	U	9.10E-02	U	9.30E-02	U	8.20E-02	U	9.30E-02	U
CHROMIUM	--	3.80E-01		5.90E-01		6.70E-01		3.10E-01		6.80E-01		1.40E-01	U	1.80E-01	U	4.60E-02	B	1.60E-01	U	1.90E-01	U
COBALT	--	7.00E-02		9.90E-02		1.10E-01		8.20E-02		3.70E-02	J	2.10E-02	J	2.30E-02	J	2.50E-02	J	3.20E-02	J	2.40E-02	J
COPPER	--	1.25E+01		1.62E+01		1.68E+01		2.02E+01		2.57E+01		6.90E-01		5.20E-01		1.41E+01		6.70E-01		9.70E-01	
IRON	--	2.53E+01		9.61E+01		1.26E+02		5.44E+01		2.05E+01		8.60E+00		3.70E+00	B	4.00E+00	B	3.50E+00	B	3.90E+00	J
LEAD	--	1.20E-01		3.60E-01		4.10E-01		2.60E-01		1.00E-01		5.00E-02	J	5.60E-02	J	3.60E-02	J	3.30E-02	J	6.10E-02	J
MANGANESE	--	8.40E+00		1.47E+01		2.38E+01		1.52E+01		3.80E+00		2.80E-01		1.60E+00		1.10E+00		1.30E+00		2.70E+00	
MERCURY	--	2.70E-02	J	2.00E-02	J	2.10E-02	J	3.00E-02		4.50E-02		4.60E-02		4.30E-02		3.70E-02		4.50E-02		4.30E-02	
NICKEL	--	7.90E-02	J	1.80E-01		2.00E-01		1.00E-01		2.40E-01		2.90E-02	J	4.10E-02	J	4.00E-02	J	3.30E-02	J	4.20E-02	J
SELENIUM	--	1.20E+00		1.20E+00		1.20E+00		1.30E+00		1.40E+00		1.00E+00		9.80E-01		9.50E-01		1.00E+00		9.20E-01	
SILVER	--	8.00E-02		1.00E-01		1.10E-01		1.50E-01		2.40E-01		3.10E-03	J	9.10E-02	U	1.20E-01		8.20E-02	U	9.30E-02	U
THALLIUM	--	8.10E-02	U	1.00E-01	U	9.10E-02	U	8.50E-02	U	9.80E-02	U	6.30E-03	J	3.20E-03	J	9.30E-02	U	8.20E-02	U	5.20E-03	J
TIN	--	2.70E-01	J	2.90E-01	J	2.60E-01	J	1.70E-01	J	1.80E-01	J	1.20E-01	J	4.60E-01	U	1.50E-01	J	4.10E-01	U	2.50E-01	J
ZINC	--	2.37E+01		2.43E+01		2.36E+01		2.26E+01		2.20E+01	J	1.38E+01		1.12E+01		1.00E+01		3.15E+01		1.15E+01	J
PAHS																					
1-METHYLNAPHTHALENE	Low	1.60E-03	U	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
2-METHYLNAPHTHALENE	Low	--	R	4.40E-03	J	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
ACENAPHTHENE	Low	4.60E-03	L	5.10E-03	J	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
ACENAPHTHYLENE	Low	1.90E-03	L	1.90E-03	J	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
ANTHRACENE	Low	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(A)ANTHRACENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(A)PYRENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(B)FLUORANTHENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(G,H,I)PERYLENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
BENZO(K)FLUORANTHENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
CHRYSENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
DIBENZO(A,H)ANTHRACENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
FLUORANTHENE	Low	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
FLUORENE	Low	3.70E-03	L	1.60E-02	U	5.20E-03	J	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
INDENO(1,2,3-CD)PYRENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U

TABLE 21
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND FIELD EFFORTS: FISH TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Whole Body Fish Tissue (mg/kg wet wt.)										Fillet Fish Tissue (mg/kgwet wt.)									
		PR-MOAM-WB-A		PR-MOAM-WB-B		PR-MOAM-WB-C		PR-MOAM-WB-D		PR-MOAM-WB-E		PR-MOAM-FT-A		PR-MOAM-FT-B		PR-MOAM-FT-C		PR-MOAM-FT-D		PR-MOAM-FT-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
NAPHTHALENE	Low	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	6.60E-03	J	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
PHENANTHRENE	Low	--	R	1.60E-02	U	1.00E-02		1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	6.30E-03	J	1.60E-02	U	1.60E-02	U
PYRENE	High	--	R	1.60E-02	U	8.00E-03	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U
PCBS																					
PCB 8 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 18 (BZ)	--	4.30E-03		6.50E-03		5.70E-03		4.70E-03		3.00E-03		2.70E-03		2.60E-03		1.90E-03	J	4.60E-03		2.10E-03	
PCB 28 (BZ)	--	6.50E-03	J	8.20E-03	J	7.50E-03	J	6.20E-03	J	4.40E-03	J	3.40E-03	J	3.30E-03	J	2.60E-03	J	5.90E-03	J	2.80E-03	J
PCB 44 (BZ)	--	7.40E-03		1.00E-02		1.10E-02		8.50E-03	J	4.50E-03		5.30E-03		4.10E-03		3.20E-03		7.90E-03		3.30E-03	
PCB 49 (BZ)	--	8.60E-03	J	1.80E-02		1.80E-02		1.10E-02		8.10E-03		7.20E-03		6.20E-03		5.00E-03		1.30E-02		5.30E-03	
PCB 52 (BZ)	--	1.30E-02	J	1.90E-02		2.00E-02		1.30E-02		8.00E-03		8.80E-03		6.80E-03		5.60E-03		1.40E-02		5.80E-03	
PCB 66 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 77 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 87 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 90 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 101 (BZ)	--	1.50E-02		1.80E-02		2.20E-02		2.00E-02		8.60E-03		8.30E-03		6.90E-03		5.70E-03		1.60E-02		6.20E-03	L
PCB 105 (BZ)	--	4.70E-03		3.40E-03	J	4.10E-03	J	4.00E-03	J	2.30E-03	J	1.60E-03	J	1.20E-03	J	1.70E-03	J	3.10E-03	J	1.90E-03	J
PCB 118 (BZ)	--	7.70E-03	J	8.20E-03	J	9.40E-03	J	9.80E-03	J	5.20E-03	J	3.90E-03	J	3.30E-03	J	2.60E-03	J	7.20E-03	J	2.90E-03	J
PCB 126 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 128 (BZ)	--	6.50E-03		8.00E-03		9.10E-03		8.80E-03		4.10E-03		2.80E-03		3.20E-03		2.30E-03		7.10E-03		2.60E-03	
PCB 138 (BZ)	--	2.10E-02	J	2.10E-02	J	2.40E-02	J	2.60E-02	J	1.30E-02	J	8.30E-03	J	9.30E-03	J	7.30E-03	J	2.00E-02	J	1.20E-02	J
PCB 153 (BZ)	--	4.10E-02		4.20E-02		4.60E-02		5.40E-02		2.80E-02		1.50E-02		1.70E-02		1.40E-02		3.80E-02		1.60E-02	
PCB 156 (BZ)	--	3.30E-03	J	3.70E-03	J	4.20E-03	J	5.00E-03	J	2.40E-03	J	1.40E-03	J	1.60E-03	J	1.10E-03	J	3.50E-03	J	1.30E-03	J
PCB 169 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 170 (BZ)	--	1.20E-02		1.40E-02		1.60E-02		1.70E-02		9.10E-03		5.30E-03	J	6.10E-03		4.60E-03	J	1.30E-02		5.30E-03	
PCB 180 (BZ)	--	1.20E-02	J	1.80E-02	J	2.00E-02	J	2.30E-02	J	1.20E-02	J	6.40E-03	J	8.00E-03	J	4.10E-03	J	1.20E-02	J	6.70E-03	J
PCB 183 (BZ)	--	4.90E-03	J	4.70E-03	J	4.70E-03	J	5.70E-03	J	3.40E-03	J	2.00E-03	J	2.00E-03	J	1.60E-03	J	4.40E-03	J	2.80E-03	J
PCB 184 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U
PCB 187 (BZ)	--	2.10E-02		2.30E-02		2.70E-02		3.20E-02		1.50E-02		7.60E-03		9.40E-03		7.50E-03		2.10E-02		8.50E-03	
PCB 195 (BZ)	--	1.40E-03	J	1.60E-03	J	1.90E-03	J	2.10E-03		1.20E-03	J	2.00E-03	U	2.00E-03	U	2.00E-03	U	1.80E-03	J	2.00E-03	U
PCB 206 (BZ)	--	6.80E-03		7.40E-03		8.60E-03		9.50E-03		5.90E-03		4.70E-03		3.50E-03		2.70E-03		8.90E-03		3.70E-03	
PCB 209 (BZ)	--	5.30E-03		5.90E-03		6.20E-03		7.50E-03		4.90E-03		4.90E-03		3.20E-03		2.60E-03		8.40E-03		3.50E-03	

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 22
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND FIELD EFFORTS: CRAB TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Crab Tissue: Meat (mg/kg wet wt.)										Crab Tissue: Mustard (mg/kg wet wt.)									
		PR-CASA-MT-A		PR-CASA-MT-B		PR-CASA-MT-C		PR-CASA-MT-D		PR-CASA-MT-E		PR-CASA-MU-A		PR-CASA-MU-B		PR-CASA-MU-C		PR-CASA-MU-D		PR-CASA-MU-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
LIPIDS																					
PERCENT LIPIDS	--	4.70E-01		4.70E-01		2.60E-01		5.30E-01		2.80E-01		4.90E+00		3.00E+00		6.70E+00		9.80E+00		7.50E+00	
METALS																					
ALUMINUM	--	2.80E+00	J	1.80E+00	J	3.10E+00		2.90E+00		3.60E+00		3.90E+00		3.00E+00		3.20E+00		6.70E+00		3.50E+00	
ANTIMONY	--	4.00E-02	B	1.30E-02	B	1.60E-02	B	1.40E-02	B	1.30E-02	B	2.40E-02	B	1.50E-02	B	3.60E-02	B	9.00E-02	B	8.30E-02	B
ARSENIC	--	9.40E-01		8.70E-01		8.30E-01		9.50E-01		9.40E-01		1.70E+00		2.10E+00		2.60E+00		2.20E+00		2.60E+00	
Speciation (Inorganic As)	--	2.60E-02		1.80E-02		--		--		--		4.70E-02		4.80E-02		--		--		--	
Speciation (As III)	--	2.20E-02	L	1.50E-02	L	--		--		--		3.00E-02	L	3.50E-02	L	--		--		--	
Speciation (As V)	--	0.00E+00	L	0.00E+00	L	--		--		--		1.70E-02	L	1.40E-02	L	--		--		--	
BERYLLIUM	--	9.60E-02	U	6.80E-02	U	8.30E-02	U	9.00E-02	U	9.00E-02	U	7.40E-02	U	8.50E-02	U	7.90E-02	U	8.20E-02	U	6.20E-02	U
CADMIUM	--	7.00E-02	J	5.20E-02	J	3.20E-02	J	2.80E-02	J	9.20E-03	J	5.60E-01		8.80E-01		4.20E-01		1.40E-01		2.50E-01	
CHROMIUM	--	1.80E-02	B	1.40E-01	U	5.50E-02	B	2.50E-02	B	3.10E-02	B	2.70E-01		3.50E-01		4.30E-01		3.00E-01		2.60E-01	
COBALT	--	3.20E-02	J	1.90E-02	J	2.70E-02	J	2.60E-02	J	3.60E-02	J	2.20E-01		2.10E-01		6.00E-01		3.60E-01		4.00E-01	
COPPER	--	1.13E+01		7.90E+00		8.50E+00		8.80E+00		9.40E+00		2.29E+01		3.78E+01		2.14E+01		1.90E+01		2.01E+01	
IRON	--	1.41E+01		8.00E+00	B	1.23E+01		1.43E+01		1.57E+01		3.22E+01		2.27E+01		4.48E+01		4.59E+01		2.95E+01	
LEAD	--	2.90E-02	J	1.70E-02	J	3.20E-02	J	2.30E-02	J	3.40E-02	J	7.80E-02		7.40E-02	J	6.90E-02	J	8.70E-02		5.60E-02	J
MANGANESE	--	3.10E+00		2.50E+00		3.20E+00		1.90E+00		2.80E+00		1.86E+01		7.60E+00		8.30E+00		1.03E+01		6.60E+00	
MERCURY	--	3.00E-02	J	1.80E-02	J	1.70E-02	J	1.60E-02	J	1.50E-02	J	3.30E-02	U	3.30E-02	U	3.30E-02	U	3.30E-02	U	1.20E-02	J
NICKEL	--	8.00E-02	J	5.80E-02	J	6.40E-02	J	4.10E-02	J	6.40E-02	J	4.30E-01		6.40E-01		8.80E-01		6.10E-01		7.20E-01	
SELENIUM	--	1.00E+00		9.80E-01		8.40E-01		8.50E-01		8.70E-01		1.10E+00		1.40E+00		1.60E+00		1.10E+00		1.70E+00	
SILVER	--	2.70E-01		1.70E-01		1.10E-01		1.70E-01		1.20E-01		6.40E-01		8.00E-01		2.90E-01		2.10E-01		2.70E-01	
THALLIUM	--	8.20E-03	J	6.80E-02	U	8.30E-02	U	9.00E-02	U	9.00E-02	U	9.90E-03	J	8.50E-02	U	7.90E-02	U	8.20E-02	U	6.20E-02	U
TIN	--	3.00E-01	L	3.40E-01	U	4.20E-01	U	1.10E-01	L	4.50E-01	U	1.30E-01	L	1.50E-01	L	4.00E-01	U	1.40E-01	J	3.10E-01	U
ZINC	--	4.04E+01		3.54E+01		4.62E+01		4.60E+01		4.18E+01		2.22E+01		2.06E+01		5.38E+01		4.33E+01		4.15E+01	
PAHS																					
1-METHYLNAPHTHALENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.80E-03	J	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
2-METHYLNAPHTHALENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
ACENAPHTHENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	7.80E-03	J	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
ACENAPHTHYLENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
ANTHRACENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
BENZO(A)ANTHRACENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
BENZO(A)PYRENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
BENZO(B)FLUORANTHENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
BENZO(G,H,I)PERYLENE	High	5.10E-03	J	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
BENZO(K)FLUORANTHENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
CHRYSENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
DIBENZO(A,H)ANTHRACENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
FLUORANTHENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
FLUORENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
INDENO(1,2,3-CD)PYRENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
NAPHTHALENE	Low	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	3.20E-03	J	2.00E-02	U	4.00E-02	U	4.80E-03	J
PHENANTHRENE	Low	1.60E-02	U	4.50E-03	J	1.60E-02	U	5.60E-03	J	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
PYRENE	High	1.60E-02	U	1.60E-02	U	1.60E-02	U	1.60E-02	U	2.00E-02	U	2.70E-02	U	2.70E-02	U	2.00E-02	U	4.00E-02	U	2.70E-02	U
PCBS																					
PCB 8 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 18 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 28 (BZ)	--	9.00E-04	J	2.00E-03	U	8.90E-04	J	8.70E-04	J	8.70E-04	J	9.70E-03	J	4.80E-03	J	1.50E-02	J	3.40E-02	J	1.70E-02	J
PCB 44 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 49 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	4.90E-02		1.00E-02	U
PCB 52 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 66 (BZ)	--	1.70E-03	J	9.30E-04	J	1.40E-03	J	1.40E-03	J	1.40E-03	J	2.40E-02		1.60E-02	J	3.60E-02		5.60E-02		4.50E-02	
PCB 77 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 87 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 90 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 101 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	4.60E-03	J	8.00E-03	U	1.00E-02	U	1.20E-02	J	1.00E-02	U
PCB 105 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	7.60E-03	J	6.80E-03	J	1.40E-02		2.20E-02		1.60E-02	

TABLE 22
VALIDATED RESULTS FROM PATAPSCO RIVER BACKGROUND FIELD EFFORTS: CRAB TISSUE COLLECTION

Analyte	Chemical Type (Molecular Weight)	Crab Tissue: Meat (mg/kg wet wt.)										Crab Tissue: Mustard (mg/kg wet wt.)									
		PR-CASA-MT-A		PR-CASA-MT-B		PR-CASA-MT-C		PR-CASA-MT-D		PR-CASA-MT-E		PR-CASA-MU-A		PR-CASA-MU-B		PR-CASA-MU-C		PR-CASA-MU-D		PR-CASA-MU-E	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
PCB 118 (BZ)	--	1.80E-03	J	1.00E-03	J	8.50E-04	J	1.00E-03	J	8.80E-04	J	1.90E-02	J	1.50E-02	J	2.60E-02	J	3.80E-02	J	3.00E-02	J
PCB 126 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 128 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	7.00E-03	J	6.50E-03	J	8.90E-03	J	1.30E-02		9.00E-03	J
PCB 138 (BZ)	--	3.30E-03	J	2.00E-03	J	1.80E-03	J	2.30E-03	J	1.70E-03	J	3.50E-02	J	3.70E-02	J	7.70E-02	J	7.10E-02	J	8.00E-02	J
PCB 153 (BZ)	--	9.20E-03		5.40E-03		3.60E-03		6.20E-03		3.70E-03		9.60E-02		9.70E-02		1.20E-01		1.40E-01		1.30E-01	
PCB 156 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	5.60E-03	J	5.50E-03	J	6.50E-03	J	1.00E-02	J	7.90E-03	J
PCB 169 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 170 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.60E-04	J	2.00E-03	U	1.80E-02	J	1.70E-02	J	2.80E-02		2.80E-02		2.80E-02	J
PCB 180 (BZ)	--	2.40E-03		1.30E-03	J	1.20E-03	J	2.10E-03	J	1.20E-03	J	3.20E-02	J	3.40E-02	J	3.40E-02	J	4.90E-02	J	4.90E-02	J
PCB 183 (BZ)	--	1.20E-03	J	2.00E-03	U	2.00E-03	U	1.00E-03	J	2.00E-03	U	1.40E-02	J	1.40E-02	J	2.10E-02	J	2.20E-02	J	1.60E-02	J
PCB 184 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 187 (BZ)	--	2.80E-03		1.80E-03	J	2.00E-03	U	1.70E-03	J	1.30E-03	J	3.40E-02		3.60E-02		3.60E-02		3.60E-02		4.10E-02	
PCB 195 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03	U	8.00E-03	U	1.00E-02	U	1.00E-02	U	1.00E-02	U
PCB 206 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.00E-03		6.90E-03	J	8.60E-03	J	7.20E-03	J	7.00E-03	J
PCB 209 (BZ)	--	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	2.00E-03	U	8.30E-03		6.90E-03	J	7.80E-03	J	7.30E-03	J	6.90E-03	J

B = The analyte is found in the associated method blank as well as in the sample.
J = The value is an estimated quantity.
K = The reported value may be biased high.
L = The reported value may be biased low.
U = Chemical was analyzed for, but not detected.
RLs are reported for non-detected (U qualified) analytes

TABLE 23

STATISTICAL COMPARISONS BETWEEN CRAB MEAT TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	2.20E-01	7.90E-01	5.14E-01	7.16E-01	5/5	2.60E-01	5.30E-01	4.02E-01	5.19E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
METALS													
ALUMINUM	5/5	2.40E+00	3.60E+00	3.16E+00	3.61E+00	5/5	1.80E+00	3.60E+00	2.84E+00	3.47E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ANTIMONY	5/5	1.30E-02	2.70E-02	1.76E-02	2.31E-02	5/5	1.30E-02	4.00E-02	1.92E-02	3.03E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ARSENIC	5/5	7.60E-01	1.00E+00	8.70E-01	9.56E-01	5/5	8.30E-01	9.50E-01	9.06E-01	9.57E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
BERYLLIUM	0/5	3.80E-02	4.65E-02	NA	4.74E-02	0/5	3.40E-02	4.80E-02	NA	4.78E-02	NA	NA	NA
CADMIUM	5/5	2.20E-02	5.00E-02	3.58E-02	4.56E-02	5/5	9.20E-03	7.00E-02	3.82E-02	6.05E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	3/5	4.90E-02	9.00E-02	6.50E-02	8.12E-02	4/5	1.80E-02	7.00E-02	3.98E-02	6.07E-02	NA	Do Not Reject H0	Does Not Exceed Background
COBALT	5/5	3.50E-02	6.00E-02	4.64E-02	5.53E-02	5/5	1.90E-02	3.60E-02	2.80E-02	3.41E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COPPER	5/5	3.60E+00	5.80E+00	4.60E+00	5.55E+00	5/5	7.90E+00	1.13E+01	9.18E+00	1.04E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
IRON	5/5	1.69E+01	2.97E+01	2.24E+01	2.69E+01	5/5	8.00E+00	1.57E+01	1.29E+01	1.57E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	5/5	4.70E-02	6.80E-02	5.96E-02	6.78E-02	5/5	1.70E-02	3.40E-02	2.70E-02	3.36E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	1.80E+00	1.04E+01	4.26E+00	7.67E+00	5/5	1.90E+00	3.20E+00	2.70E+00	3.20E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	5/5	1.30E-02	2.20E-02	1.60E-02	1.95E-02	5/5	1.50E-02	3.00E-02	1.92E-02	2.51E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
NICKEL	5/5	6.30E-02	9.50E-02	8.10E-02	9.42E-02	5/5	4.10E-02	8.00E-02	6.14E-02	7.48E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SELENIUM	5/5	7.60E-01	1.00E+00	8.22E-01	9.18E-01	5/5	8.40E-01	1.00E+00	9.08E-01	9.80E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SILVER	5/5	1.10E-01	2.40E-01	1.64E-01	2.19E-01	5/5	1.10E-01	2.70E-01	1.68E-01	2.28E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
THALLIUM	0/5	3.80E-02	4.65E-02	NA	4.74E-02	1/5	8.20E-03	4.50E-02	3.47E-02	4.95E-02	NA	NA	NA
TIN	0/5	1.90E-01	2.30E-01	NA	2.37E-01	2/5	1.10E-01	3.00E-01	2.03E-01	2.70E-01	NA	NA	NA
ZINC	5/5	3.58E+01	4.43E+01	4.09E+01	4.42E+01	5/5	3.54E+01	4.62E+01	4.20E+01	4.62E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
2-METHYLNAPHTHALENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
ACENAPHTHENE	2/5	5.10E-03	1.35E-02	9.42E-03	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	1/5	3.40E-03	1.35E-02	9.28E-03	1.34E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	2/5	4.10E-03	1.35E-02	9.62E-03	1.34E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)ANTHRACENE	1/5	8.00E-03	2.70E-02	1.40E-02	2.14E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)PYRENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(B)FLUORANTHENE	2/5	8.00E-03	2.10E-02	1.40E-02	1.84E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(G,H,I)PERYLENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	1/5	5.10E-03	1.00E-02	7.82E-03	9.49E-03	NA	NA	NA
BENZO(K)FLUORANTHENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
CHRYSENE	1/5	8.00E-03	1.35E-02	1.08E-02	1.34E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
DIBENZO(A,H)ANTHRACENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
FLUORANTHENE	3/5	8.80E-03	6.10E-02	2.72E-02	4.85E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
FLUORENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	0/5	8.00E-03	1.35E-02	NA	1.31E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
NAPHTHALENE	3/5	3.50E-03	1.35E-02	7.28E-03	1.09E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
PHENANTHRENE	3/5	4.20E-03	1.35E-02	1.01E-02	1.44E-02	2/5	4.50E-03	1.00E-02	7.22E-03	9.30E-03	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	2/5	8.00E-03	3.30E-02	1.53E-02	2.51E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

TABLE 23

STATISTICAL COMPARISONS BETWEEN CRAB MEAT TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	4/5	8.00E-03	9.20E-02	2.77E-02	6.25E-02	1/5	5.10E-03	1.00E-02	9.02E-03	1.11E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	4/5	8.00E-03	1.72E-01	6.61E-02	1.43E-01	1/5	1.00E-02	1.33E-01	3.46E-02	8.71E-02	NA	NA	NA
TOTAL LMW PAH (ND = 0)	4/5	6.10E-03	7.97E-02	3.68E-02	6.88E-02	2/5	4.50E-03	1.00E-02	8.02E-03	1.06E-02	NA	NA	NA
TOTAL LMW PAH (ND = DL)	4/5	8.00E-03	2.22E-01	1.25E-01	2.00E-01	2/5	1.00E-02	1.34E-01	5.92E-02	1.23E-01	NA	NA	NA
PCBS													
PCB 8 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 18 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 28 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	4/5	8.70E-04	1.00E-03	9.06E-04	9.58E-04	NA	NA	NA
PCB 44 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 49 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 52 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 66 (BZ)	3/5	1.00E-03	1.20E-03	1.08E-03	1.18E-03	5/5	9.30E-04	1.70E-03	1.37E-03	1.63E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 87 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 90 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 101 (BZ)	1/5	1.00E-03	1.10E-03	1.02E-03	1.06E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 105 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 118 (BZ)	3/5	9.10E-04	1.60E-03	1.20E-03	1.51E-03	5/5	8.50E-04	1.80E-03	1.11E-03	1.48E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 128 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 138 (BZ)	5/5	1.60E-03	3.20E-03	2.16E-03	2.87E-03	5/5	1.70E-03	3.30E-03	2.22E-03	2.84E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 153 (BZ)	5/5	2.70E-03	6.70E-03	4.56E-03	6.42E-03	5/5	3.60E-03	9.20E-03	5.62E-03	7.80E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 156 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 169 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 170 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	1/5	8.60E-04	1.00E-03	9.72E-04	1.03E-03	NA	NA	NA
PCB 180 (BZ)	3/5	9.70E-04	1.70E-03	1.23E-03	1.56E-03	5/5	1.20E-03	2.40E-03	1.64E-03	2.18E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	1/5	8.30E-04	1.00E-03	9.66E-04	1.04E-03	2/5	1.00E-03	1.20E-03	1.04E-03	1.13E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 187 (BZ)	2/5	1.00E-03	1.90E-03	1.34E-03	1.79E-03	4/5	1.00E-03	2.80E-03	1.72E-03	2.37E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 206 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 209 (BZ)	2/5	9.30E-04	1.10E-03	1.01E-03	1.06E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	5/5	8.60E-03	3.22E-02	2.00E-02	3.04E-02	5/5	1.95E-02	4.42E-02	2.87E-02	3.82E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = DL)	5/5	6.88E-02	8.02E-02	7.44E-02	7.91E-02	5/5	6.61E-02	8.82E-02	7.35E-02	8.19E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect, or all tests were not be conducted because all values were non-detects.

TABLE 24

STATISTICAL COMPARISONS BETWEEN CRAB MUSTARD TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	5.40E+00	7.90E+00	6.74E+00	7.92E+00	5/5	3.00E+00	9.80E+00	6.38E+00	8.84E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
METALS													
ALUMINUM	5/5	8.20E+00	2.29E+01	1.34E+01	1.89E+01	5/5	3.00E+00	6.70E+00	4.06E+00	5.50E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTIMONY	5/5	3.00E-02	9.20E-02	5.82E-02	8.11E-02	5/5	1.50E-02	9.00E-02	4.96E-02	8.26E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	5/5	1.20E+00	2.30E+00	1.94E+00	2.35E+00	5/5	1.70E+00	2.60E+00	2.24E+00	2.60E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	0/5	3.60E-02	4.85E-02	NA	4.74E-02	0/5	3.10E-02	4.25E-02	NA	4.25E-02	NA	NA	NA
CADMIUM	5/5	2.90E-01	6.30E-01	4.78E-01	6.09E-01	5/5	1.40E-01	8.80E-01	4.50E-01	7.25E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
CHROMIUM	5/5	2.70E-01	8.90E-01	4.56E-01	6.94E-01	5/5	2.60E-01	4.30E-01	3.22E-01	3.89E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
COBALT	5/5	2.90E-01	4.80E-01	3.58E-01	4.33E-01	5/5	2.10E-01	6.00E-01	3.58E-01	5.10E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COPPER	5/5	1.50E+01	4.16E+01	2.26E+01	3.33E+01	5/5	1.90E+01	3.78E+01	2.42E+01	3.16E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	5/5	8.44E+01	1.39E+02	1.02E+02	1.22E+02	5/5	2.27E+01	4.59E+01	3.50E+01	4.46E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	5/5	2.80E-01	6.20E-01	3.80E-01	5.12E-01	5/5	5.60E-02	8.70E-02	7.28E-02	8.37E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	7.40E+00	1.38E+01	1.10E+01	1.35E+01	5/5	6.60E+00	1.86E+01	1.03E+01	1.49E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MERCURY	1/5	1.20E-02	1.65E-02	1.56E-02	1.75E-02	1/5	1.20E-02	1.65E-02	1.56E-02	1.75E-02	NA	Do Not Reject H0	Does Not Exceed Background
NICKEL	5/5	3.90E-01	6.30E-01	5.10E-01	5.98E-01	5/5	4.30E-01	8.80E-01	6.56E-01	8.12E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	5/5	1.10E+00	1.40E+00	1.26E+00	1.37E+00	5/5	1.10E+00	1.70E+00	1.38E+00	1.64E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SILVER	5/5	3.80E-01	8.90E-01	5.72E-01	7.98E-01	5/5	2.10E-01	8.00E-01	4.42E-01	6.91E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
THALLIUM	3/5	2.20E-03	4.85E-02	1.92E-02	3.98E-02	1/5	9.90E-03	4.25E-02	3.28E-02	4.57E-02	NA	Do Not Reject H0	Does Not Exceed Background
TIN	4/5	1.20E-01	2.50E-01	1.72E-01	2.18E-01	3/5	1.30E-01	2.00E-01	1.55E-01	1.81E-01	NA	Do Not Reject H0	Does Not Exceed Background
ZINC	5/5	3.06E+01	5.29E+01	4.59E+01	5.52E+01	5/5	2.06E+01	5.38E+01	3.63E+01	5.00E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	1/5	2.80E-03	2.00E-02	1.20E-02	1.79E-02	NA	NA	NA
2-METHYLNAPHTHALENE	2/4	7.60E-03	2.00E-02	1.40E-02	2.00E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	5/5	1.20E-02	3.30E-02	2.30E-02	3.17E-02	1/5	7.80E-03	2.00E-02	1.30E-02	1.74E-02	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	4/4	7.40E-03	2.10E-02	1.19E-02	1.91E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	2/4	8.40E-03	2.00E-02	1.42E-02	1.98E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(A)ANTHRACENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	NA	NA
BENZO(A)PYRENE	1/4	1.35E-02	2.60E-02	1.99E-02	2.59E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(B)FLUORANTHENE	2/4	1.35E-02	7.70E-02	3.39E-02	6.82E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
BENZO(G,H,I)PERYLENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	NA	NA
BENZO(K)FLUORANTHENE	1/4	1.35E-02	2.10E-02	1.86E-02	2.27E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
CHRYSENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	NA	NA
FLUORANTHENE	4/4	6.80E-02	2.00E-01	1.33E-01	2.06E-01	0/5	1.00E-02	2.00E-02	NA	1.76E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
FLUORENE	2/4	8.30E-03	2.00E-02	1.28E-02	1.90E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	0/4	1.35E-02	2.00E-02	NA	2.22E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	NA	NA
NAPHTHALENE	5/5	2.30E-02	5.90E-02	3.86E-02	5.60E-02	2/5	3.20E-03	2.00E-02	1.03E-02	1.68E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PHENANTHRENE	3/4	1.90E-02	2.90E-02	2.23E-02	2.76E-02	0/5	1.00E-02	2.00E-02	NA	1.76E-02	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	4/4	3.20E-02	1.10E-01	6.65E-02	1.12E-01	0/5	1.00E-02	2.00E-02	NA	1.76E-02	**Reject H0**	**Reject H0**	**Exceeds Background**

TABLE 24

STATISTICAL COMPARISONS BETWEEN CRAB MUSTARD TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	4/4	3.20E-02	1.87E-01	1.04E-01	1.99E-01	0/5	1.35E-02	1.35E-02	NA	1.35E-02	**Reject H0**	**Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	4/4	2.48E-01	4.67E-01	3.58E-01	4.63E-01	0/5	1.35E-02	1.35E-02	NA	1.35E-02	NA	NA	NA
TOTAL LMW PAH (ND = 0)	5/5	4.30E-02	3.78E-01	2.04E-01	3.38E-01	3/5	3.20E-03	1.35E-02	9.12E-03	1.37E-02	NA	NA	NA
TOTAL LMW PAH (ND = DL)	5/5	4.30E-02	4.18E-01	2.82E-01	4.19E-01	3/5	1.35E-02	2.21E-01	1.33E-01	2.38E-01	NA	NA	NA
PCBS													
PCB 8 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 18 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 28 (BZ)	5/5	6.10E-03	9.00E-03	7.50E-03	8.72E-03	5/5	4.80E-03	3.40E-02	1.61E-02	2.67E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	1/5	1.30E-03	5.00E-03	2.86E-03	4.35E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	4/5	1.00E-03	2.70E-02	1.80E-02	2.74E-02	1/5	4.00E-03	4.90E-02	1.34E-02	3.24E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 66 (BZ)	5/5	1.60E-02	2.50E-02	2.12E-02	2.49E-02	5/5	1.60E-02	5.60E-02	3.54E-02	5.06E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 77 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 87 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 90 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 101 (BZ)	5/5	2.10E-03	8.10E-03	4.30E-03	6.50E-03	2/5	4.00E-03	1.20E-02	6.12E-03	9.28E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 105 (BZ)	5/5	8.60E-03	1.20E-02	1.05E-02	1.17E-02	5/5	6.80E-03	2.20E-02	1.33E-02	1.93E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	5/5	1.40E-02	2.20E-02	1.90E-02	2.19E-02	5/5	1.50E-02	3.80E-02	2.56E-02	3.42E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 128 (BZ)	5/5	5.40E-03	9.10E-03	7.18E-03	8.49E-03	5/5	6.50E-03	1.30E-02	8.88E-03	1.13E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	5/5	2.50E-02	4.50E-02	3.64E-02	4.36E-02	5/5	3.50E-02	8.00E-02	6.00E-02	8.11E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 153 (BZ)	5/5	5.10E-02	1.10E-01	8.14E-02	1.02E-01	5/5	9.60E-02	1.40E-01	1.17E-01	1.35E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 156 (BZ)	5/5	3.60E-03	6.00E-03	4.94E-03	5.85E-03	5/5	5.50E-03	1.00E-02	7.10E-03	8.90E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 170 (BZ)	5/5	1.20E-02	1.90E-02	1.54E-02	1.80E-02	5/5	1.70E-02	2.80E-02	2.38E-02	2.93E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	5/5	1.70E-02	3.50E-02	2.54E-02	3.17E-02	5/5	3.20E-02	4.90E-02	3.96E-02	4.78E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	5/5	5.20E-03	1.10E-02	8.30E-03	1.04E-02	5/5	1.40E-02	2.20E-02	1.74E-02	2.11E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/5	1.00E-03	5.00E-03	NA	4.37E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	NA	NA
PCB 187 (BZ)	5/5	1.70E-02	3.40E-02	2.50E-02	3.15E-02	5/5	3.40E-02	4.10E-02	3.66E-02	3.91E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	1/5	1.30E-03	5.00E-03	2.86E-03	4.35E-03	0/5	4.00E-03	5.00E-03	NA	5.12E-03	NA	Do Not Reject H0	Does Not Exceed Background
PCB 206 (BZ)	5/5	8.10E-03	1.30E-02	9.76E-03	1.16E-02	5/5	6.90E-03	8.60E-03	7.54E-03	8.24E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 209 (BZ)	5/5	9.20E-03	1.30E-02	1.08E-02	1.23E-02	5/5	6.90E-03	8.30E-03	7.44E-03	8.02E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = 0)	5/5	3.64E-01	6.33E-01	5.07E-01	6.01E-01	5/5	5.40E-01	9.98E-01	7.58E-01	9.47E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = DL)	5/5	3.88E-01	7.73E-01	5.85E-01	7.22E-01	5/5	6.68E-01	1.14E+00	8.98E-01	1.10E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect, or all tests were not be conducted because all values were non-detects.

TABLE 25
STATISTICAL COMPARISONS BETWEEN TOTAL CRAB TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)				
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]
LIPIDS										
PERCENT LIPIDS	5/5	1.19E+00	2.12E+00	1.68E+00	2.06E+00	5/5	7.71E-01	2.26E+00	1.52E+00	2.07E+00
METALS										
ALUMINUM	5/5	3.48E+00	7.20E+00	5.06E+00	6.46E+00	5/5	2.02E+00	4.18E+00	3.07E+00	3.85E+00
ANTIMONY	5/5	1.62E-02	3.91E-02	2.52E-02	3.39E-02	5/5	1.34E-02	4.93E-02	2.49E-02	4.01E-02
ARSENIC	5/5	8.42E-01	1.24E+00	1.07E+00	1.22E+00	5/5	9.92E-01	1.26E+00	1.16E+00	1.26E+00
BERYLLIUM	0/5	3.76E-02	4.69E-02	NA	4.74E-02	0/5	3.34E-02	4.70E-02	NA	4.68E-02
CADMIUM	5/5	7.20E-02	1.58E-01	1.18E-01	1.51E-01	5/5	3.36E-02	2.21E-01	1.15E-01	1.85E-01
CHROMIUM	3/5	9.03E-02	2.39E-01	1.38E-01	1.96E-01	4/5	6.32E-02	1.37E-01	9.25E-02	1.22E-01
COBALT	5/5	8.26E-02	1.38E-01	1.05E-01	1.26E-01	5/5	5.47E-02	1.41E-01	8.96E-02	1.23E-01
COPPER	5/5	5.73E+00	1.25E+01	7.97E+00	1.07E+01	5/5	9.97E+00	1.62E+01	1.20E+01	1.44E+01
IRON	5/5	2.95E+01	5.01E+01	3.72E+01	4.47E+01	5/5	1.07E+01	2.13E+01	1.70E+01	2.11E+01
LEAD	5/5	9.05E-02	1.71E-01	1.19E-01	1.51E-01	5/5	2.43E-02	4.39E-02	3.55E-02	4.30E-02
MANGANESE	5/5	2.85E+00	1.10E+01	5.52E+00	8.76E+00	5/5	2.78E+00	6.07E+00	4.11E+00	5.38E+00
MERCURY	4/5	1.28E-02	2.10E-02	1.59E-02	1.91E-02	4/5	1.44E-02	2.75E-02	1.85E-02	2.36E-02
NICKEL	5/5	1.24E-01	1.95E-01	1.61E-01	1.88E-01	5/5	1.14E-01	2.29E-01	1.72E-01	2.12E-01
SELENIUM	5/5	8.23E-01	1.07E+00	9.04E-01	1.00E+00	5/5	8.89E-01	1.13E+00	9.96E-01	1.10E+00
SILVER	5/5	1.60E-01	3.61E-01	2.40E-01	3.27E-01	5/5	1.29E-01	3.69E-01	2.19E-01	3.15E-01
THALLIUM	1/5	3.13E-02	4.69E-02	3.94E-02	4.60E-02	1/5	8.52E-03	4.45E-02	3.44E-02	4.88E-02
TIN	1/5	1.77E-01	2.34E-01	2.11E-01	2.33E-01	2/5	1.14E-01	2.81E-01	1.94E-01	2.53E-01
ZINC	5/5	3.48E+01	4.59E+01	4.18E+01	4.63E+01	5/5	3.26E+01	4.76E+01	4.09E+01	4.69E+01
PAHS										
1-METHYLNAPHTHALENE	0/5	9.03E-03	1.47E-02	NA	1.48E-02	0/5	9.03E-03	1.47E-02	NA	1.09E-02
2-METHYLNAPHTHALENE	0/5	7.93E-03	1.47E-02	NA	1.44E-02	0/5	7.93E-03	1.47E-02	NA	1.08E-02
ACENAPHTHENE	3/5	6.39E-03	1.71E-02	1.20E-02	1.66E-02	3/5	6.39E-03	1.71E-02	1.20E-02	1.08E-02
ACENAPHTHYLENE	2/5	4.15E-03	1.49E-02	9.76E-03	1.44E-02	2/5	4.15E-03	1.49E-02	9.76E-03	1.08E-02
ANTHRACENE	2/5	4.90E-03	1.47E-02	1.05E-02	1.46E-02	2/5	4.90E-03	1.47E-02	1.05E-02	1.08E-02
BENZO(A)ANTHRACENE	1/5	9.03E-03	2.57E-02	1.48E-02	2.16E-02	1/5	9.03E-03	2.57E-02	1.48E-02	1.08E-02
BENZO(A)PYRENE	0/5	9.03E-03	1.58E-02	NA	1.55E-02	0/5	9.03E-03	1.58E-02	NA	1.08E-02
BENZO(B)FLUORANTHENE	2/5	9.03E-03	3.15E-02	1.77E-02	2.77E-02	2/5	9.03E-03	3.15E-02	1.77E-02	1.08E-02
BENZO(G,H,I)PERYLENE	0/5	9.03E-03	1.47E-02	NA	1.48E-02	0/5	9.03E-03	1.47E-02	NA	1.10E-02
BENZO(K)FLUORANTHENE	0/5	9.03E-03	1.49E-02	NA	1.49E-02	0/5	9.03E-03	1.49E-02	NA	1.08E-02
CHRYSENE	1/5	9.03E-03	1.47E-02	1.22E-02	1.51E-02	1/5	9.03E-03	1.47E-02	1.22E-02	1.08E-02
DIBENZO(A,H)ANTHRACENE	0/5	9.03E-03	1.47E-02	NA	1.48E-02	0/5	9.03E-03	1.47E-02	NA	1.08E-02
FLUORANTHENE	3/5	1.99E-02	8.69E-02	4.70E-02	7.79E-02	3/5	1.99E-02	8.69E-02	4.70E-02	1.08E-02
FLUORENE	0/5	8.06E-03	1.47E-02	NA	1.42E-02	0/5	8.06E-03	1.47E-02	NA	1.08E-02
INDENO(1,2,3-CD)PYRENE	0/5	9.03E-03	1.47E-02	NA	1.48E-02	0/5	9.03E-03	1.47E-02	NA	1.08E-02
NAPHTHALENE	3/5	7.14E-03	2.20E-02	1.31E-02	1.93E-02	3/5	7.14E-03	2.20E-02	1.31E-02	1.07E-02
PHENANTHRENE	3/5	6.96E-03	1.64E-02	1.24E-02	1.69E-02	3/5	6.96E-03	1.64E-02	1.24E-02	1.08E-02
PYRENE	2/5	1.25E-02	4.74E-02	2.49E-02	4.13E-02	2/5	1.25E-02	4.74E-02	2.49E-02	1.08E-02

TABLE 25
STATISTICAL COMPARISONS BETWEEN TOTAL CRAB TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)				
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]
TOTAL HMW PAH (ND = 0)	2/5	1.25E-02	1.10E-01	4.19E-02	8.81E-02	2/5	1.25E-02	1.10E-01	4.19E-02	1.16E-02
TOTAL HMW PAH (ND = DL)	2/5	5.28E-02	2.27E-01	1.21E-01	2.03E-01	2/5	5.28E-02	2.27E-01	1.21E-01	7.34E-02
TOTAL LMW PAH (ND = 0)	4/5	1.30E-02	1.35E-01	6.80E-02	1.19E-01	4/5	1.30E-02	1.35E-01	6.80E-02	1.12E-02
TOTAL LMW PAH (ND = DL)	4/5	1.45E-02	2.59E-01	1.54E-01	2.41E-01	4/5	1.45E-02	2.59E-01	1.54E-01	1.45E-01
PCBS										
PCB 8 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 18 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 28 (BZ)	1/5	1.95E-03	2.49E-03	2.21E-03	2.44E-03	4/5	1.60E-03	7.16E-03	3.74E-03	5.76E-03
PCB 44 (BZ)	0/5	1.06E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 49 (BZ)	1/5	1.00E-03	5.85E-03	4.17E-03	5.94E-03	0/5	1.56E-03	9.96E-03	NA	6.86E-03
PCB 52 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 66 (BZ)	3/5	3.80E-03	5.64E-03	4.84E-03	5.61E-03	5/5	3.74E-03	1.18E-02	7.72E-03	1.08E-02
PCB 77 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 87 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 90 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 101 (BZ)	2/5	1.21E-03	2.41E-03	1.63E-03	2.08E-03	0/5	1.56E-03	3.05E-03	NA	2.55E-03
PCB 105 (BZ)	1/5	2.42E-03	3.05E-03	2.78E-03	3.01E-03	1/5	2.08E-03	4.92E-03	3.29E-03	4.41E-03
PCB 118 (BZ)	3/5	3.35E-03	5.41E-03	4.52E-03	5.31E-03	5/5	3.49E-03	8.56E-03	5.68E-03	7.60E-03
PCB 126 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 128 (BZ)	1/5	1.82E-03	2.51E-03	2.15E-03	2.40E-03	1/5	2.03E-03	3.24E-03	2.47E-03	2.93E-03
PCB 138 (BZ)	5/5	5.97E-03	1.10E-02	8.55E-03	1.05E-02	5/5	7.92E-03	1.76E-02	1.30E-02	1.74E-02
PCB 153 (BZ)	5/5	1.17E-02	2.60E-02	1.89E-02	2.43E-02	5/5	2.08E-02	3.36E-02	2.63E-02	3.16E-02
PCB 156 (BZ)	1/5	1.49E-03	1.93E-03	1.74E-03	1.91E-03	1/5	1.84E-03	2.68E-03	2.14E-03	2.47E-03
PCB 169 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 170 (BZ)	1/5	3.05E-03	4.36E-03	3.69E-03	4.17E-03	2/5	3.87E-03	6.04E-03	5.23E-03	6.31E-03
PCB 180 (BZ)	3/5	3.96E-03	7.92E-03	5.74E-03	7.19E-03	5/5	6.95E-03	1.11E-02	8.73E-03	1.07E-02
PCB 183 (BZ)	2/5	1.65E-03	2.87E-03	2.34E-03	2.78E-03	3/5	3.43E-03	5.08E-03	4.09E-03	4.85E-03
PCB 184 (BZ)	0/5	1.00E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 187 (BZ)	3/5	3.99E-03	7.89E-03	5.76E-03	7.34E-03	4/5	7.16E-03	9.93E-03	8.23E-03	9.22E-03
PCB 195 (BZ)	0/5	1.06E-03	1.75E-03	NA	1.63E-03	0/5	1.56E-03	1.75E-03	NA	1.77E-03
PCB 206 (BZ)	1/5	2.33E-03	3.24E-03	2.64E-03	2.98E-03	1/5	2.10E-03	2.42E-03	2.22E-03	2.35E-03
PCB 209 (BZ)	3/5	2.47E-03	3.32E-03	2.84E-03	3.17E-03	1/5	2.10E-03	2.36E-03	2.20E-03	2.31E-03
TOTAL PCBS (ND = 0)	5/5	7.50E-02	1.44E-01	1.11E-01	1.37E-01	5/5	1.17E-01	2.22E-01	1.65E-01	2.08E-01
TOTAL PCBS (ND = DL)	5/5	1.28E-01	2.10E-01	1.70E-01	1.99E-01	5/5	1.78E-01	2.84E-01	2.27E-01	2.72E-01

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect, or all tests were not be conducted because all values were non-detects.

TABLE 26

STATISTICAL COMPARISONS BETWEEN FISH FILLET TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	8.00E-01	2.40E+00	1.29E+00	1.90E+00	5/5	1.30E+00	5.00E+00	2.44E+00	3.84E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
METALS													
ALUMINUM	5/5	6.70E-01	2.00E+00	1.49E+00	2.00E+00	5/5	3.90E-01	9.80E-01	6.92E-01	9.28E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ANTIMONY	5/5	4.60E-03	1.40E-02	1.00E-02	1.35E-02	5/5	1.40E-02	8.60E-02	3.18E-02	6.09E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ARSENIC	5/5	3.20E-01	4.80E-01	3.88E-01	4.43E-01	5/5	3.60E-01	5.70E-01	4.84E-01	5.62E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	0/5	4.25E-02	4.80E-02	NA	4.77E-02	0/5	3.45E-02	4.65E-02	NA	4.77E-02	NA	NA	NA
CADMIUM	0/5	4.25E-02	4.80E-02	NA	4.77E-02	0/5	3.45E-02	4.65E-02	NA	4.77E-02	NA	NA	NA
CHROMIUM	2/5	1.00E-02	9.00E-02	6.94E-02	1.02E-01	1/5	4.90E-02	9.50E-02	7.68E-02	9.42E-02	NA	Do Not Reject H0	Does Not Exceed Background
COBALT	5/5	1.40E-02	3.10E-02	2.44E-02	3.19E-02	5/5	2.10E-02	3.20E-02	2.50E-02	2.90E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COPPER	5/5	7.50E-01	4.50E+00	1.91E+00	3.37E+00	5/5	5.20E-01	1.41E+01	3.39E+00	9.10E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
IRON	5/5	3.60E+00	7.80E+00	5.38E+00	7.02E+00	5/5	3.50E+00	8.60E+00	4.74E+00	6.81E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
LEAD	5/5	8.20E-02	2.60E-01	1.84E-01	2.49E-01	5/5	3.30E-02	6.10E-02	4.72E-02	5.89E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	1.40E+00	4.00E+00	2.54E+00	3.52E+00	5/5	2.80E-01	2.70E+00	1.40E+00	2.23E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MERCURY	5/5	3.70E-02	5.60E-02	4.84E-02	5.55E-02	5/5	3.70E-02	4.60E-02	4.28E-02	4.61E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
NICKEL	5/5	3.10E-02	6.20E-02	4.72E-02	6.02E-02	5/5	2.90E-02	4.20E-02	3.70E-02	4.24E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SELENIUM	5/5	7.60E-01	9.70E-01	8.46E-01	9.25E-01	5/5	9.20E-01	1.00E+00	9.70E-01	1.00E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SILVER	2/5	1.80E-02	4.60E-02	3.89E-02	5.02E-02	2/5	3.10E-03	1.20E-01	5.12E-02	9.17E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
THALLIUM	0/5	4.25E-02	4.80E-02	NA	4.77E-02	3/5	3.20E-03	4.65E-02	2.04E-02	4.08E-02	NA	NA	NA
TIN	3/5	1.10E-01	2.30E-01	1.60E-01	2.14E-01	3/5	1.20E-01	2.50E-01	1.91E-01	2.43E-01	NA	Do Not Reject H0	Does Not Exceed Background
ZINC	5/5	9.40E+00	1.36E+01	1.14E+01	1.28E+01	5/5	1.00E+01	3.15E+01	1.56E+01	2.42E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PAHS													
1-METHYLNAPHTHALENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
2-METHYLNAPHTHALENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
ACENAPHTHENE	1/5	3.60E-03	1.35E-02	8.22E-03	1.16E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
ANTHRACENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(A)ANTHRACENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(A)PYRENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(B)FLUORANTHENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(G,H,I)PERYLENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
BENZO(K)FLUORANTHENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
CHRYSENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
FLUORANTHENE	1/5	8.00E-03	1.40E-02	1.07E-02	1.35E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	Do Not Reject H0	Does Not Exceed Background
FLUORENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA
NAPHTHALENE	2/5	4.10E-03	1.35E-02	9.32E-03	1.31E-02	1/5	6.60E-03	8.00E-03	7.72E-03	8.32E-03	NA	Do Not Reject H0	Does Not Exceed Background
PHENANTHRENE	2/5	4.30E-03	1.35E-02	7.92E-03	1.12E-02	1/5	6.30E-03	1.00E-02	8.06E-03	9.31E-03	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	0/5	8.00E-03	1.35E-02	NA	1.18E-02	0/5	8.00E-03	1.00E-02	NA	9.25E-03	NA	NA	NA

TABLE 26

STATISTICAL COMPARISONS BETWEEN FISH FILLET TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	0/5	8.00E-03	8.00E-03	NA	8.00E-03	0/5	8.00E-03	8.00E-03	NA	8.00E-03	NA	NA	NA
TOTAL HMW PAH (ND = DL)	0/5	8.00E-03	8.00E-03	NA	8.00E-03	0/5	8.00E-03	8.00E-03	NA	8.00E-03	NA	NA	NA
TOTAL LMW PAH (ND = 0)	3/5	8.00E-03	2.24E-02	1.22E-02	1.81E-02	2/5	6.30E-03	8.00E-03	7.38E-03	8.20E-03	NA	NA	NA
TOTAL LMW PAH (ND = DL)	3/5	8.00E-03	1.42E-01	8.42E-02	1.51E-01	2/5	8.00E-03	1.67E-01	6.50E-02	1.40E-01	NA	NA	NA
PCBS													
PCB 8 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 18 (BZ)	4/5	9.50E-04	1.80E-03	1.37E-03	1.74E-03	5/5	1.90E-03	4.60E-03	2.78E-03	3.80E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	5/5	1.10E-03	2.30E-03	1.66E-03	2.13E-03	5/5	2.60E-03	5.90E-03	3.60E-03	4.87E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	5/5	1.70E-03	3.80E-03	2.48E-03	3.25E-03	5/5	3.20E-03	7.90E-03	4.76E-03	6.62E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 49 (BZ)	5/5	1.50E-03	6.10E-03	3.82E-03	5.40E-03	5/5	5.00E-03	1.30E-02	7.34E-03	1.05E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 52 (BZ)	5/5	3.20E-03	6.90E-03	4.68E-03	6.02E-03	5/5	5.60E-03	1.40E-02	8.20E-03	1.15E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 66 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 77 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 87 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 90 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 101 (BZ)	5/5	4.20E-03	9.10E-03	6.38E-03	8.11E-03	5/5	5.70E-03	1.60E-02	8.62E-03	1.27E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 105 (BZ)	5/5	1.10E-03	2.60E-03	1.88E-03	2.39E-03	5/5	1.20E-03	3.10E-03	1.90E-03	2.58E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 118 (BZ)	5/5	2.50E-03	4.20E-03	3.24E-03	3.85E-03	5/5	2.60E-03	7.20E-03	3.98E-03	5.76E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 126 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 128 (BZ)	5/5	1.60E-03	3.50E-03	2.56E-03	3.22E-03	5/5	2.30E-03	7.10E-03	3.60E-03	5.49E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 138 (BZ)	5/5	7.70E-03	1.60E-02	1.17E-02	1.52E-02	5/5	7.30E-03	2.00E-02	1.14E-02	1.63E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 153 (BZ)	5/5	1.20E-02	2.10E-02	1.68E-02	2.03E-02	5/5	1.40E-02	3.80E-02	2.00E-02	2.97E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 156 (BZ)	5/5	8.80E-04	1.80E-03	1.42E-03	1.76E-03	5/5	1.10E-03	3.50E-03	1.78E-03	2.71E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 169 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 170 (BZ)	5/5	3.70E-03	7.40E-03	6.04E-03	7.49E-03	5/5	4.60E-03	1.30E-02	6.86E-03	1.02E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 180 (BZ)	4/5	3.20E-03	6.30E-03	5.54E-03	6.82E-03	5/5	4.10E-03	1.20E-02	7.44E-03	1.02E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	5/5	1.70E-03	4.20E-03	2.84E-03	3.71E-03	5/5	1.60E-03	4.40E-03	2.56E-03	3.63E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 184 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 187 (BZ)	5/5	5.50E-03	1.10E-02	8.84E-03	1.10E-02	5/5	7.50E-03	2.10E-02	1.08E-02	1.63E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	1/5	1.00E-03	1.80E-03	1.16E-03	1.50E-03	NA	NA	NA
PCB 206 (BZ)	5/5	3.20E-03	7.30E-03	5.56E-03	7.12E-03	5/5	2.70E-03	8.90E-03	4.70E-03	7.04E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 209 (BZ)	5/5	3.40E-03	6.70E-03	5.44E-03	6.85E-03	5/5	2.60E-03	8.40E-03	4.52E-03	6.74E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = 0)	5/5	9.91E-02	1.92E-01	1.46E-01	1.79E-01	5/5	1.26E-01	3.40E-01	1.88E-01	2.70E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
TOTAL PCBS (ND = DL)	5/5	1.19E-01	2.12E-01	1.67E-01	2.00E-01	5/5	1.46E-01	3.60E-01	2.08E-01	2.90E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect, or all tests were not be conducted because all values were non-detects.

TABLE 27

STATISTICAL COMPARISONS BETWEEN FISH WHOLE BODY TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
LIPIDS													
PERCENT LIPIDS	5/5	2.60E+00	4.30E+00	3.52E+00	4.17E+00	5/5	4.10E+00	5.80E+00	4.68E+00	5.30E+00	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
METALS													
ALUMINUM	5/5	4.70E+00	3.22E+01	1.63E+01	2.95E+01	5/5	4.50E+00	8.36E+01	3.79E+01	6.93E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ANTIMONY	5/5	1.40E-02	8.30E-02	3.24E-02	5.96E-02	5/5	1.20E-02	6.90E-02	3.02E-02	5.27E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
ARSENIC	5/5	5.00E-01	7.00E-01	5.84E-01	6.66E-01	5/5	5.10E-01	8.10E-01	6.88E-01	8.02E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
BERYLLIUM	0/5	4.15E-02	4.70E-02	NA	4.57E-02	0/5	4.05E-02	5.00E-02	NA	4.94E-02	NA	NA	NA
CADMIUM	0/5	4.15E-02	4.70E-02	NA	4.57E-02	0/5	4.05E-02	5.00E-02	NA	4.94E-02	NA	NA	NA
CHROMIUM	5/5	1.10E-01	3.60E-01	2.04E-01	3.01E-01	5/5	3.10E-01	6.80E-01	5.26E-01	6.89E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COBALT	5/5	4.60E-02	1.10E-01	7.36E-02	9.89E-02	5/5	3.70E-02	1.10E-01	7.96E-02	1.07E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
COPPER	5/5	1.51E+01	3.41E+01	2.39E+01	3.05E+01	5/5	1.25E+01	2.57E+01	1.83E+01	2.30E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
IRON	5/5	4.55E+01	1.42E+02	9.21E+01	1.32E+02	5/5	2.05E+01	1.26E+02	6.45E+01	1.08E+02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
LEAD	5/5	3.70E-01	7.80E-01	6.06E-01	7.74E-01	5/5	1.00E-01	4.10E-01	2.50E-01	3.82E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
MANGANESE	5/5	2.90E+00	1.47E+01	9.34E+00	1.42E+01	5/5	3.80E+00	2.38E+01	1.32E+01	2.04E+01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
MERCURY	5/5	2.20E-02	3.40E-02	2.96E-02	3.42E-02	5/5	2.00E-02	4.50E-02	2.86E-02	3.82E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
NICKEL	5/5	6.90E-02	1.50E-01	1.02E-01	1.36E-01	5/5	7.90E-02	2.40E-01	1.60E-01	2.25E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
SELENIUM	5/5	1.40E+00	1.80E+00	1.56E+00	1.70E+00	5/5	1.20E+00	1.40E+00	1.26E+00	1.35E+00	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
SILVER	5/5	2.10E-01	4.90E-01	3.04E-01	4.14E-01	5/5	8.00E-02	2.40E-01	1.36E-01	1.97E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
THALLIUM	2/5	5.40E-03	4.40E-02	2.90E-02	4.78E-02	0/5	4.05E-02	5.00E-02	NA	4.94E-02	NA	Do Not Reject H0	Does Not Exceed Background
TIN	5/5	1.60E-01	2.80E-01	2.22E-01	2.73E-01	5/5	1.70E-01	2.90E-01	2.34E-01	2.86E-01	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
ZINC	5/5	2.48E+01	3.21E+01	2.86E+01	3.11E+01	5/5	2.20E+01	2.43E+01	2.32E+01	2.41E+01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PAHS													
1-METHYLNAPHTHALENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
2-METHYLNAPHTHALENE	1/5	4.00E-03	8.00E-03	6.60E-03	8.46E-03	1/4	4.00E-03	8.00E-03	6.10E-03	8.69E-03	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHENE	4/5	6.20E-03	1.10E-02	7.84E-03	9.68E-03	2/5	4.00E-03	8.00E-03	5.94E-03	7.77E-03	NA	Do Not Reject H0	Does Not Exceed Background
ACENAPHTHYLENE	5/5	4.50E-03	9.00E-03	7.08E-03	8.80E-03	0/4	1.90E-03	8.00E-03	4.76E-03	7.70E-03	NA	Do Not Reject H0	Does Not Exceed Background
ANTHRACENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
BENZO(A)ANTHRACENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
BENZO(A)PYRENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
BENZO(B)FLUORANTHENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
BENZO(G,H,I)PERYLENE	1/5	8.40E-04	8.00E-03	5.77E-03	8.87E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	Do Not Reject H0	Does Not Exceed Background
BENZO(K)FLUORANTHENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
CHRYSENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	0/5	4.00E-03	8.00E-03	NA	8.49E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	NA	NA
FLUORANTHENE	4/5	8.00E-03	5.90E-02	3.38E-02	5.10E-02	0/4	4.00E-03	8.00E-03	NA	9.35E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
FLUORENE	1/5	4.00E-03	8.00E-03	7.04E-03	8.69E-03	2/5	3.70E-03	8.00E-03	6.58E-03	8.50E-03	NA	Do Not Reject H0	Does Not Exceed Background
INDENO(1,2,3-CD)PYRENE	1/5	3.20E-03	8.00E-03	6.24E-03	8.55E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	Do Not Reject H0	Does Not Exceed Background
NAPHTHALENE	2/5	4.00E-03	1.90E-02	1.16E-02	1.82E-02	0/4	4.00E-03	8.00E-03	NA	9.35E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PHENANTHRENE	1/5	4.00E-03	1.00E-02	7.60E-03	9.69E-03	1/4	8.00E-03	1.00E-02	8.50E-03	9.68E-03	NA	Do Not Reject H0	Does Not Exceed Background
PYRENE	1/5	4.00E-03	8.00E-03	5.88E-03	7.80E-03	0/4	4.00E-03	8.00E-03	NA	9.35E-03	NA	Do Not Reject H0	Does Not Exceed Background

TABLE 27

STATISTICAL COMPARISONS BETWEEN FISH WHOLE BODY TISSUE COLLECTED AT THE COKE POINT OFFSHORE AREA AND THE PATAPSCO RIVER BACKGROUND AREA

Analyte	Coke Point Offshore Area (mg/kg)					Patapsco River Background Area (mg/kg)					Result of Quantile Test [B]	Result of Wilcox Rank Sum Test	Conclusion
	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]	Frequency of Detection	Minimum	Maximum	Mean	95% UCLM[A]			
TOTAL HMW PAH (ND = 0)	2/5	4.00E-03	5.40E-03	4.29E-03	4.88E-03	0/4	8.00E-03	8.00E-03	NA	8.00E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL HMW PAH (ND = DL)	2/5	4.00E-03	1.33E-01	4.11E-02	9.55E-02	0/4	8.00E-03	8.00E-03	NA	8.00E-03	NA	NA	NA
TOTAL LMW PAH (ND = 0)	5/5	4.50E-03	9.80E-02	5.76E-02	9.31E-02	3/5	8.00E-03	1.52E-02	1.06E-02	1.34E-02	NA	NA	NA
TOTAL LMW PAH (ND = DL)	5/5	9.50E-02	1.78E-01	1.31E-01	1.63E-01	3/5	8.00E-03	1.07E-01	4.10E-02	8.48E-02	NA	NA	NA
PCBS													
PCB 8 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 18 (BZ)	5/5	3.10E-03	5.90E-03	4.18E-03	5.21E-03	5/5	3.00E-03	6.50E-03	4.84E-03	6.12E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 28 (BZ)	5/5	4.30E-03	7.30E-03	5.42E-03	6.50E-03	5/5	4.40E-03	8.20E-03	6.56E-03	7.94E-03	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 44 (BZ)	5/5	7.60E-03	1.20E-02	9.52E-03	1.11E-02	5/5	4.50E-03	1.10E-02	8.28E-03	1.07E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 49 (BZ)	5/5	1.20E-02	1.90E-02	1.50E-02	1.76E-02	5/5	8.10E-03	1.80E-02	1.27E-02	1.74E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 52 (BZ)	5/5	1.40E-02	2.20E-02	1.74E-02	2.05E-02	5/5	8.00E-03	2.00E-02	1.46E-02	1.93E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 66 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 77 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 87 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 90 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 101 (BZ)	5/5	1.90E-02	2.60E-02	2.28E-02	2.58E-02	5/5	8.60E-03	2.20E-02	1.67E-02	2.17E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 105 (BZ)	5/5	4.10E-03	7.80E-03	6.44E-03	7.87E-03	5/5	2.30E-03	4.70E-03	3.70E-03	4.57E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 118 (BZ)	5/5	9.50E-03	1.20E-02	1.09E-02	1.20E-02	5/5	5.20E-03	9.80E-03	8.06E-03	9.79E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 126 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 128 (BZ)	5/5	7.90E-03	1.00E-02	8.92E-03	9.77E-03	5/5	4.10E-03	9.10E-03	7.30E-03	9.26E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 138 (BZ)	5/5	2.50E-02	4.50E-02	3.02E-02	3.82E-02	5/5	1.30E-02	2.60E-02	2.10E-02	2.57E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 153 (BZ)	5/5	4.70E-02	5.90E-02	5.24E-02	5.69E-02	5/5	2.80E-02	5.40E-02	4.22E-02	5.12E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 156 (BZ)	5/5	4.30E-03	5.70E-03	4.94E-03	5.45E-03	5/5	2.40E-03	5.00E-03	3.72E-03	4.65E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 169 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 170 (BZ)	5/5	1.60E-02	2.10E-02	1.78E-02	1.98E-02	5/5	9.10E-03	1.70E-02	1.36E-02	1.66E-02	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 180 (BZ)	5/5	1.40E-02	2.30E-02	1.98E-02	2.32E-02	5/5	1.20E-02	2.30E-02	1.70E-02	2.17E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 183 (BZ)	5/5	6.40E-03	8.00E-03	6.96E-03	7.64E-03	5/5	3.40E-03	5.70E-03	4.68E-03	5.47E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 184 (BZ)	0/5	1.00E-03	1.00E-03	NA	1.00E-03	0/5	1.00E-03	1.00E-03	NA	1.00E-03	NA	NA	NA
PCB 187 (BZ)	5/5	2.60E-02	3.00E-02	2.74E-02	2.93E-02	5/5	1.50E-02	3.20E-02	2.36E-02	2.97E-02	Do Not Reject H0	Do Not Reject H0	Does Not Exceed Background
PCB 195 (BZ)	5/5	1.90E-03	2.60E-03	2.18E-03	2.48E-03	5/5	1.20E-03	2.10E-03	1.64E-03	1.99E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 206 (BZ)	5/5	1.30E-02	2.10E-02	1.54E-02	1.88E-02	5/5	5.90E-03	9.50E-03	7.64E-03	9.00E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
PCB 209 (BZ)	5/5	1.10E-02	2.00E-02	1.34E-02	1.71E-02	5/5	4.90E-03	7.50E-03	5.96E-03	6.91E-03	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = 0)	5/5	3.99E-01	5.37E-01	4.66E-01	5.20E-01	5/5	2.34E-01	4.54E-01	3.75E-01	4.61E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**
TOTAL PCBS (ND = DL)	5/5	4.19E-01	5.57E-01	4.86E-01	5.40E-01	5/5	2.54E-01	4.74E-01	3.95E-01	4.81E-01	**Reject H0**	**Do Not Reject H0**	**Exceeds Background**

Bold = Coke Point Offshore Area detected chemical concentration statistically exceeds Patapsco River Background Area

A) When a 95% UCLM is not available for a chemical due to a low frequency of detection that limits calculation, the maximum detected concentration is used.

B) NA = Quantile test could not be conducted, because the upper quantile is a nondetect, or all tests were not be conducted because all values were non-detects.

ATTACHMENTS

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ATTACHMENT A:

WORK PLAN FOR FIELD AND LABORATORY BIOACCUMULATION STUDIES IN SUPPORT OF THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT, BALTIMORE, MARYLAND

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FINAL

WORK PLAN FOR FIELD AND LABORATORY BIOACCUMULATION STUDIES IN SUPPORT OF THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT, BALTIMORE, MARYLAND

Prepared for:

Maryland Port Administration
MPA World Trade Center
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WORK PLAN FOR BIOACCUMULATION STUDIES IN SUPPORT OF THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT, BALTIMORE, MARYLAND

The Sparrows Point Facility is located on approximately 2,300 acres on the north side of the Patapsco River in Baltimore County, Maryland, approximately 9 miles southeast of downtown Baltimore (**Figure 1**). The Maryland Port Administration (MPA) has expressed an interest in acquiring the Coke Point Peninsula (Coke Point) on the Sparrows Point property as a potential site for a Dredged Material Containment Facility (DMCF) for placement of dredged material from channels in the Baltimore Harbor. At the direction of the MPA, EA conducted a risk assessment of the Coke Point Offshore Area (EA 2010). The risk assessment was designed to characterize comparative risks between the Coke Point Offshore Area and background areas (**Figure 2**). As such, ecological and human health risks were calculated separately for each area based on concentrations of chemicals in sediment and surface water. Calculations utilized information regarding bioaccumulation of chemicals in fish and crab tissue from sources in regulatory guidance and the scientific literature. Site-specific information regarding bioaccumulation is desired by the MPA to provide an estimate of risks that is more representative of actual human and wildlife exposures but also linkable to the influence of the site.

1.0 PURPOSE

The risk assessment focused on calculating risk associated with Coke Point Offshore Area environment as compared to background and therefore, does not reflect the mobility of crabs and fish which allows them to be exposed to conditions in wider areas. This work plan provides details of the proposed tissue sampling and analysis methods for field and laboratory studies to further refine the risk assessment calculations. Proposed studies include field collection of crab and fish tissue for chemical analysis; laboratory evaluation of contaminant bioaccumulation from sediment; and calculation of ecological and human health risk using the site-specific field and laboratory tissue data. Fish and crabs collected in field studies of the Coke Point offshore area and background area will provide information on tissue concentrations resulting from organisms moving freely within and between these environments. Laboratory studies are important because they help identify whether there is a link between Coke Point sediment concentrations and increased contributions to risk over background. This work plan incorporates input to from the U.S. Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE) obtained during conference calls and reviews of the summarized study design.

2.0 FIELD STUDIES OF AQUATIC ORGANISM TISSUE

This proposed field study will provide site-specific data necessary to determine what the predicted risks from Coke Point chemicals of concern (COCs) (i.e., metals, PAHs, PCBs) are to wildlife and people consuming crabs and fish caught around Coke Point and in the Patapsco River. This estimate of risk will be based on site-specific tissue data.

Field studies will answer the following questions:

- What are anticipated risks from Coke Point chemicals of concern (COCs) (i.e., metals, PAH, PCBs) to wildlife and people consuming crabs and fish caught around Coke Point and in the Patapsco River based on site-specific tissue data?
- Is there a discernable difference in tissue concentrations between Coke Point and background areas?

2.1 STUDY DESIGN

Field efforts will include collection of crab tissue and fish tissue. Tissue will be collected from the offshore area around Coke Point in locations known to contain elevated concentrations of chemicals (**Figure 3**). The risk assessment of Coke Point Offshore Areas identified areas of elevated concentrations as occurring within a 1,000 foot area bordering the shoreline of the peninsula starting at the mouth of the Turning Basin and extending west and north to the graving dock area. The risk assessment identified highest concentrations occurring within the mouth of the Turning Basin and west of the Coke Oven area. The Turning Basin has also been identified as containing elevated chemical concentrations. Due to the high concentrations of COCs detected in these areas, they are identified as the areas where fish and crab tissue will be collected.

Tissue will also be collected from a background area directly northwest of Soller's Point within the Patapsco River (**Figure 3**). This area was included in the background area evaluated in the risk assessment.

Target species will be blue crab (*Callinectes sapidus)* and channel catfish (*Ictalurus punctatus*) (**Table 1**). Should abundance of these species be insufficient to support sampling, alternative target species for fish will be white perch (*Morone americana*), or brown bullhead catfish (*Ameiurus nebulosus*). Channel catfish are the preferred target species, but salinities observed in Baltimore Harbor at the time this work plan was written are higher than the expected tolerance for channel catfish due to low precipitation levels, therefore it is expected that white perch will be the prevalent species collected. Should these species be unavailable in sufficient numbers, alternative targets will be discussed with MPA and MES. Fillets and whole body composites will be tested for fish. Fillet composites will consist of fillets from one side of the fish. The fillets from the other side will be frozen and archived individually for future analysis, if needed; half of the whole fish will also be preserved, should sample volume requirements allow. Both meat and hepatopancreas (mustard) samples will be collected from blue crab. Both fillet and whole body fish tissue will be analyzed because humans are expected to consume mostly fillets and wildlife are expected to consume whole body fish. Both crab meat and mustard (hepatopancreas) will be analyzed because humans may consume both, and chemical concentrations in mustard are expected to be higher than those in meat.

Five composite samples will be created for each tissue type for each species at each location, for a total of 40 composite samples (**Table 1**); each composite will be composed of tissue from a minimum target number of three individual organisms (for a total of approximately 60 individual organisms). Individuals will be of a size standard (legal size) suitable for consumption according to Maryland state guidelines for recreational fishing. Size standards for each of the species discussed above are:

- **White perch**: Target length = 5 inches or longer. There is no state size limit for recreational hook and line capture; size limit is greater than 8 inches for other gear. Fish greater than 5 inches will be targeted as samplers will be using hook and line techniques and these would be the specimens most likely consumed by humans.
- **Channel catfish**: Target length = 10 inches or longer. The state limit for channel catfish is 10 inches.
- **Brown bullhead catfish**: Target length = 7 inches or longer. No limit is listed in state regulations for brown bullhead catfish. Fish greater than 7 inches will be targeted as these would be the specimens most likely consumed by humans.
- **Blue crab**: 5.25 inches or wider (carapace width). State limits for male crabs collected between July 15 and December 15 is 5.25 inches; limits for male crabs collected between April 1 and July 14 is 5 inches. The larger size is selected based on time of year.

Tissue samples will be analyzed for metals, PAHs, PCBs, and arsenic speciation. These chemicals were identified as COCs in the risk assessment for either humans or ecological receptors. Arsenic speciation is included because the risk assessment used literature-based assumptions regarding the form of arsenic, and site-specific information would aid in refining assessment results. Dioxins were not included in analyses because risks from dioxins were generally lower than those for other COCs.

2.2 METHODS

2.2.1 Specimen Collection

EA will be responsible for obtaining the scientific collection permit and reporting fish collection information back to Maryland Department of Natural Resources (MDNR), as required by the permit conditions (**Appendix B**). Specimen collection will be conducted in accordance with the MDE collection permit. Crabs will be captured using a combination of crab traps, trot lines, and crab pots; crab pots will be affixed to permanent structures to avoid navigation hazards. Fish will be captured using jug and line, hook and line, fish traps, or otter trawl. The duration of each trawl will be limited to 5 minutes to limit by-catch and mortality. Collection is planned for September and October 2010: collection should be conducted as soon as possible since blue crab migration from the upper Chesapeake Bay will occur in the fall.

2.2.2 Individual Specimen Log-In and Labeling

For each fish captured, the specimen capture location, capture method, collection personnel, species, mass and length will be recorded using the field data sheets in **Appendix A**. Specimens of target species which meet the size requirements discussed above will be placed in individual plastic bags and labeled for later compositing.

For target species fish, individual specimens will be placed in airtight plastic bags and frozen at the end of each day. For crabs, individuals will be kept in bushel baskets separated by area, frozen, and bagged at the end of each day. A waterproof label will be placed in each bag or affixed to individual crabs with the following information:

- **Sample Name** – A unique sample identifier will be assigned to each individual collected for potential use in composites. The identifier will be composed of the following abbreviations separated by dashes:
    - **Site:** CP will be used for samples from the Coke Point Offshore Area, and PR samples will be used for samples from the Patapsco River Background Area.
    - **Species:** Species will be indicated by the first two letters of the genus and species combined.
        - CASA – Blue crab
        - ICPU – Channel catfish
        - MOAM – White perch
        - AMNE – Brown bullhead
    - **Sample number:** Samples will be numbered sequentially in the order specimens are logged in. Numbers will be given a three digit identifier (e.g. -001, -002, -003…).
- **Date and time** – The label will include the date and time the sample was collected.
- **Sample initials** – The label will include the initials of the sampler.
- **Project name and number** – The label will include the project name – "Coke Point Tissue Studies" – and number - 1453417.

The individual specimen sample identifier will also be recorded on the field data form (**Appendix A**). Individuals will be held until a sufficient number have been obtained to prepare composite samples.

2.2.3 Composite Preparation, Labeling, and Preservation

Composites will be assembled using fish or crabs of similar weights. Individuals will be selected for use in a composite such that the size of each individual will be within 75% of the size of all other individuals within that composite, per the following equation:

$$\frac{Minimum\ Size}{Maximum\ Size} \times 100 = _____ \geq 75\%$$

The target number of organisms for use in each composite will be three; it may be necessary to use more than three individuals for a composite based on the mass required for analysis, which is approximately 50 grams. It is expected that more than three individuals may be required to achieve the minimum mass for crab mustard. Sample preparation will be conducted in accordance with *EPA Guidance for Assessing Chemical Contamination Data for Use in Fish Advisories Volume 1 Fish Sampling and Analysis – Third Edition* (USEPA 2000).

The make-up of each composite sample will be recorded on the appropriate data sheet in **Appendix A** along with the information above. All composite samples will be labeled with the following:

- **Sample Name** – A unique sample identifier will be assigned to each individual collected for potential use in composites. The identifier will be composed of the following abbreviations separated by dashes:

- **Site:** CP will be used for samples from the Coke Point Offshore Area, and PR samples will be used for samples from the Patapsco River Background Area.
- **Species:** Species will be indicated by the first two letters of the genus and species combined.
  - CASA – Blue crab
  - ICPU – Channel catfish
  - MOAM – White perch
  - AMNE – Brown bullhead
- **Tissue:** Tissue will be indicated by a two letter identifier:
  - WB – Whole body
  - FT – Fillet
  - MT – Meat
  - MS – Mustard
- **Sample Identifier:** Samples will be lettered alphabetically in the order specimens are prepared.

- **Date and time** – The label will include the date and time the sample was collected.
- **Sampler initials** – The label will include the initials of the sampler.
- **Project name and number** – The label will include the project name – "Coke Point Tissue Studies" – and number - 1453417.

The same information will be recorded on the sample label. Individual specimens will then be removed from their bags placed in a single labeled plastic bag per composite for shipment to the lab. Fish will be filleted in the analytical laboratory. Fish may be allowed to thaw to just above freezing to facilitate filleting. Fillet composites will consist of fillets from one side of the fish. The fillets from the other side will be frozen and archived for future analysis, if needed. Fillets will include the fish skin (USEPA 2000). Whole body fish composites will consist of the whole fish, including scales.

Crabs will be steamed to facilitate separation of meat and mustard from shell. Once enough crabs have collected, both meat and "mustard" samples will be collected from blue crab by hand; care will be taken to maintain meat and mustard as separate tissues. Meat and mustard composites for crabs may require more than three individuals per composite, and will be dependent upon the mass required for analysis. Crab tissues will be placed in glass jars on ice for shipment to keep samples at 4°C or cooler.

The sample containers, preservatives, and holding time requirements for tissue samples are provided in **Table 2**.

2.2.4 Laboratory Quality Control Samples

Quality control samples will be analyzed for tissue samples at the frequency stated in the following table. Standard Reference Materials (SRMs) will be obtained from the National Institute of Standards and Technology (NIST) or a comparable source, if available.

QC Sample	Frequency
Standard Reference Material	1 per analytical batch of 1-20 samples, where available
Method Blanks	1 per analytical batch of 1-20 samples
Laboratory Control Sample	1 per analytical batch of 1-20 samples
Sample Duplicates	1 per analytical batch of 1-20 samples (Inorganic Analyses)
Rinse blank	1 per analytical batch of 1-20 samples
Matrix Spike/Matrix Spike Duplicate	1 per analytical batch of 1-20 samples

2.2.5 Analytical Testing

Tissue samples will be analyzed for lipids, metals, PCBs, and PAHs. Two of the five composite samples for each species from each location (site and background) will be submitted for arsenic speciation (**Table 1**). Analytical testing of tissue will be conducted by Test America and Brooks Rand Laboratories (arsenic speciation). Data will be validated by Environmental Data Services (EDS), Inc. Fish tissue will be submitted to the laboratory as whole frozen fish, the laboratory will be contracted to conduct the filleting of the fish. Prepared crabmeat and mustard will be submitted to the laboratory in glass jars at temperatures at or below 4°C. Analytical limits for fish tissue are presented in **Table 3**.

2.2.6 Equipment Decontamination Procedures

Equipment that will come into direct contact with tissue during sampling will be decontaminated prior to deployment in the field and between each composite to minimize cross-contamination. This includes knives and bowls used in tissue processing. While performing the decontamination procedure, phthalate-free nitrile gloves will be used to prevent phthalate contamination of the sampling equipment or the samples.

The decontamination procedure is described below:

- Rinse equipment using site water
- Rinse with 10 percent nitric acid (HNO_3)
- Rinse with distilled or de-ionized water
- Rinse with methanol followed by hexane
- Rinse with distilled or de-ionized water
- Air dry (in area not adjacent to the decontamination area)

Waste liquids will be contained during decontamination procedures and transferred to EA's facility in Sparks, Maryland, for disposal.

2.2.7 Data Analysis

Analytical data will be validated. Maximum and reasonable maximum exposure tissue concentrations will be calculated based on the data and used in revision of wildlife food web and human health exposure models. The risk assessment for the Coke Point Offshore Area will be revised accordingly.

3.0 LABORATORY BIOACCUMULATION STUDIES

The proposed laboratory bioaccumulation studies are designed to identify potential concentrations of chemicals in aquatic prey items/food sources exposed to site and background sediments. Laboratory bioaccumulation studies provide data that can be used to determine if Coke Point sediments are associated with higher bioaccumulation of COCs than background area sediments. Site-specific data from the studies will be used to refine calculations of anticipated risks from Coke Point COCs to wildlife and people consuming crabs and fish around Coke Point and the Patapsco River. Laboratory studies are important because, regardless of field study results, they investigate the link between Coke Point sediment concentrations and increased contributions to risk from prolonged and multiple exposures over background.

3.1 STUDY DESIGN

Bioaccumulation tests will be conducted on clams and aquatic worms using sediment composites representative of surface sediment from the Coke Point Offshore Area, the background area, and a control (**Table 1**). Surface sediment will be collected from three to five locations around Coke Point and three locations in the background area via grab sampler; sufficient volume of sediment will be collected to support chemical analytical and bioassay testing (**Table 1**). The control sediment is representative of the sediment from which the clams were collected and shipped to the laboratory.

Surface sediment will be collected from three to five locations around Coke Point and three locations in the background area via grab sampler (**Figure 4**); sufficient volume of sediment will be collected to support chemical analytical and bioaccumulation testing. It is assumed that a maximum of 2 field days will be required for sediment collection and processing. The holding time will be initiated at the time of sample collection.

The target locations of sediment sample collection in the Coke Point Offshore Area were selected based on chemical concentrations observed in previous sampling. Sample locations were chosen based on past results for high and low molecular weight PAHs, PCBs, and metals. For each chemical, or suite of chemicals (e.g. PAHs), the previous sampling locations were examined for concentrations of COCs similar to or slightly higher than those used as reasonable maximum exposure point concentrations for surface sediment in the risk assessment (**Table 4**). From these, five sample locations were selected for collection of discrete surface sediment samples: BH-SED-03C, BH-SED-10, SP09-02, SP09-03, and SB-1. Sample coordinates are listed in **Table 5**.

Background stations EH-2, EH-3, and EH-4 were selected for sediment sampling because these areas previously demonstrated relatively low chemical concentrations consistent with those considered representative of background and are located in the area of background fish and crab tissue collection. Other background samples demonstrated either elevated chemical concentrations considered unrepresentative of overall background conditions or were distant from expected crabbing areas. Based on the sediment analysis, one or more samples will be identified that can be composited to provide a representative distribution of metals, PCBs, and PAH concentrations for bioaccumulation testing. Sediment analysis will also verify an appropriate background sample or background composite combination for bioaccumulation testing.

3.2 METHODS

3.2.1 Discrete Sediment Sampling and Compositing Methods

Discrete sediment samples will be collected from each of the selected locations using a Ponar sampler. Between 1 and 5 grabs will be collected from each site to obtain the required sample volume. Discrete sediment samples will be homogenized and subsampled. A portion from each location will be placed in separate jars corresponding to each analysis, preserved in accordance with **Table 2**, and shipped to the lab for rapid turn-around analysis (7 day turn-around-time). The remaining sediment will be preserved in a 5-gallon sealed plastic container at 4 degrees Celsius. All samples will be labeled with sample number, location, date, initials of the sampling crew, and media, and placed in a cooler of ice (**Appendix C**).

Following receipt of analytical data, results will be evaluated to determine which samples should be composited for the bioaccumulation exposures. The ideal composite would contain levels of metals, PAHs, and PCBs approximating the 95% UCL of the mean utilized as an exposure point concentration in the risk assessment. Equal mass of one or more sediment samples will be composited in a stainless steel container. This material will be sub-sampled for metals, PAHs, and PCBs per the preservation requirements in **Table 2** and samples will be sent to the analytical laboratory for analysis. Remaining material will be submitted to EA's Ecotoxicology Laboratory for use in bioaccumulation bioassays.

3.2.2 Equipment Decontamination Procedures

Equipment that will come into direct contact with sediment during sampling will be decontaminated prior to deployment in the field and between each sampling location to minimize cross-contamination. This includes the Ponar grab sampler and stainless steel processing equipment (spoons, knives, bowls, etc.). While performing the decontamination procedure, phthalate-free nitrile gloves will be used to prevent phthalate contamination of the sampling equipment or the samples.

The decontamination procedure is described below:

- Rinse equipment using site water
- Rinse with 10 percent nitric acid (HNO_3)
- Rinse with distilled or de-ionized water
- Rinse with methanol followed by hexane
- Rinse with distilled or de-ionized water
- Air dry (in area not adjacent to the decontamination area)

Waste liquids will be contained during decontamination procedures and transferred to EA's facility in Sparks, Maryland, for disposal.

3.2.3 Bioaccumulation Exposure Methods

28-day laboratory bioaccumulation tests will be conducted as static renewal assays for clams (*Macoma nasuta*) and aquatic worms (*Nereis virens*) using the sediment composites for Coke Point and the background area. These aquatic organisms used in the bioaccumulation tests were selected because they ingest sediments and survive equally well in dredged material and control and reference sediments. They are also standard organisms as designated by EPA for use in lab bioaccumulation studies.

Methodology for the bioaccumulation studies will follow guidance in USEPA/USACE (1998), USEPA, and USEPA/USACE (1991). The *N. virens* bioaccumulation test will be conducted in 10-gallon aquaria with 6.5 liters (L) of sediment and 26 L of overlying water per aquarium. The *M. nasuta* bioaccumulation test will be conducted in 5-gallon aquaria with 4 L of sediment and 11.5 L of overlying water per aquarium. There will be five replicates per background and test sediment, and three replicates per control sediment. The number of organisms used in the bioaccumulation tests will be dictated by the minimum amount of tissue required for analysis.

During the 28-day exposure period, the test chambers will be maintained at a target temperature of 20±1°C for *N. virens* and 12±1°C for *M. nasuta*, with a 16-hour light/8-hour dark photoperiod. Gentle aeration will be provided to each aquarium throughout the test period. The organisms will not be fed during the exposure period. Observations of mortality and abnormal organism behavior will be recorded daily, and dead organisms will be removed, as observed, from the test chambers.

After 28 days of exposure, surviving organisms will be recovered and placed in holding tanks containing artificial sea water and no sediment to purge their digestive tracts. The test species specified in guidance are chosen because they are known to accumulate chemicals and are hardy species expected to survive elevated chemical concentrations for the test duration. At the end of the 24-hour purging period, the shells of the clams will be rinsed with de-ionized (DI) water, the clams will be shucked, and the soft tissues and liquids inside the shell will be placed into pre-cleaned glass jars. Worms will be rinsed with DI water to remove the external salts (originating from the purge chambers) and will be placed directly into pre-cleaned glass jars. Tissues for each replicate will be placed into separate jars, labeled, and frozen until delivered to the

analytical laboratory. Required containers, preservation techniques, and holding time requirements for tissue samples are provided in **Table 2**.

3.2.4 Analytical Testing

Discrete sediment samples will be analyzed for metals, PCBs, and PAHs on a rapid-turn-around basis. Results will be evaluated to identify one or more sediment samples which can be composited to provide a representative distribution of metals, PCBs, and PAH concentrations for bioaccumulation testing. The composite will also be analyzed for hexavalent chromium. Chromium speciation is included because the risk assessment used literature-based assumptions regarding the form of organic arsenic, and site-specific information would aid in refining assessment results. Results will also be evaluated to identify the most appropriate background sample or background composite combination for bioaccumulation testing. The sediment composite and one background composite will also be analyzed for metals, PAHs, and PCBs. Analytical testing of sediment and data validation will be contracted directly by MES. Analytical project limits for sediment samples are presented in **Table 3.**

At the end of the test period, tissue from each species will be harvested from each replicate. All the tissue in each replicate will be composited to create a sample for that replicate. These samples will be submitted for chemical analysis for metals, PAHs, PCBs, and lipids. Two of the five replicate samples for each species from each location (site and background) will be submitted for arsenic speciation. Arsenic speciation is included because the risk assessment used literature-based assumptions regarding the form of organic arsenic, and site-specific information would aid in refining assessment results. Control tissue and pre-test tissue will also be analyzed for COCs; however, control and pre-test tissues will consist of only three replicates.

3.2.5 Data Analysis

Following validation of the laboratory bioaccumulation tissue data, the effects of the Coke Point Offshore Area sediments on test organism survival and chemical accumulation in tissues will be evaluated by statistical comparison to tests with the background sediment. Statistical analyses of survival data and tissue chemistry data will be performed according to procedures outlined in the ITM (USEPA/USACE 1998) and the OTM (USEPA/USACE 1991). Site-specific BSAFs will be calculated based on the data and used in revision of wildlife food web and human health exposure models. The risk assessment for the Coke Point Offshore Area will be revised accordingly.

4.0 REFERENCES

EA Engineering, Science, and Technology, Inc. (EA). [2010.] *Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point*. Internal Draft Review. June.

U.S. Environmental Protection Agency (USEPA). 2000. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1 Fish Sampling and Analysis Third Edition.* EPA 823-B-00-007. November.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE). 1998. *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual (ITM).* EPA-823-B-98-004.

U.S. Environmental Protection Agency (USEPA) / U.S. Army Corp of Engineers (USACE). 1991. *Evaluation of Dredged Material Proposed for Ocean Disposal.* EPA-503/8-91/001. "The Green Book."

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Figures

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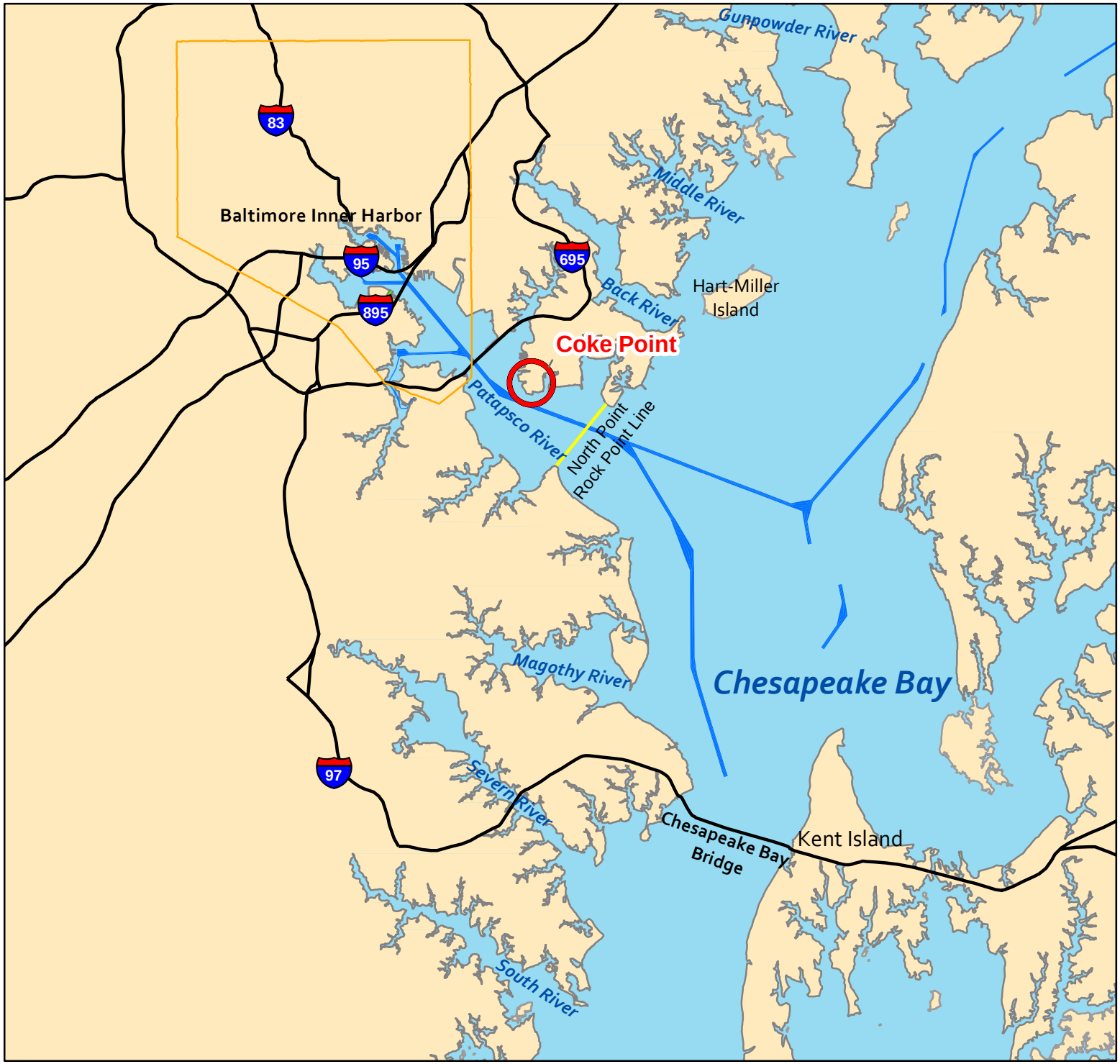

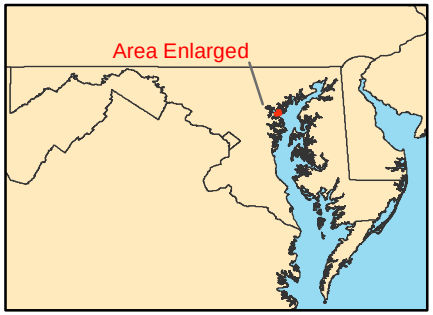

Legend

- Federal Navigation Channels
- Roads
- Baltimore City

Miles

0 4 8

Figure 1
Coke Point Location

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Legend

Areas of Concern

Feet

0 750 1,500

Figure 2
Coke Point
Areas of Concern

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Study Areas

Feet

0 1,800 3,600

Figure 3
Proposed Fish and Crab Tissue Sampling Locations

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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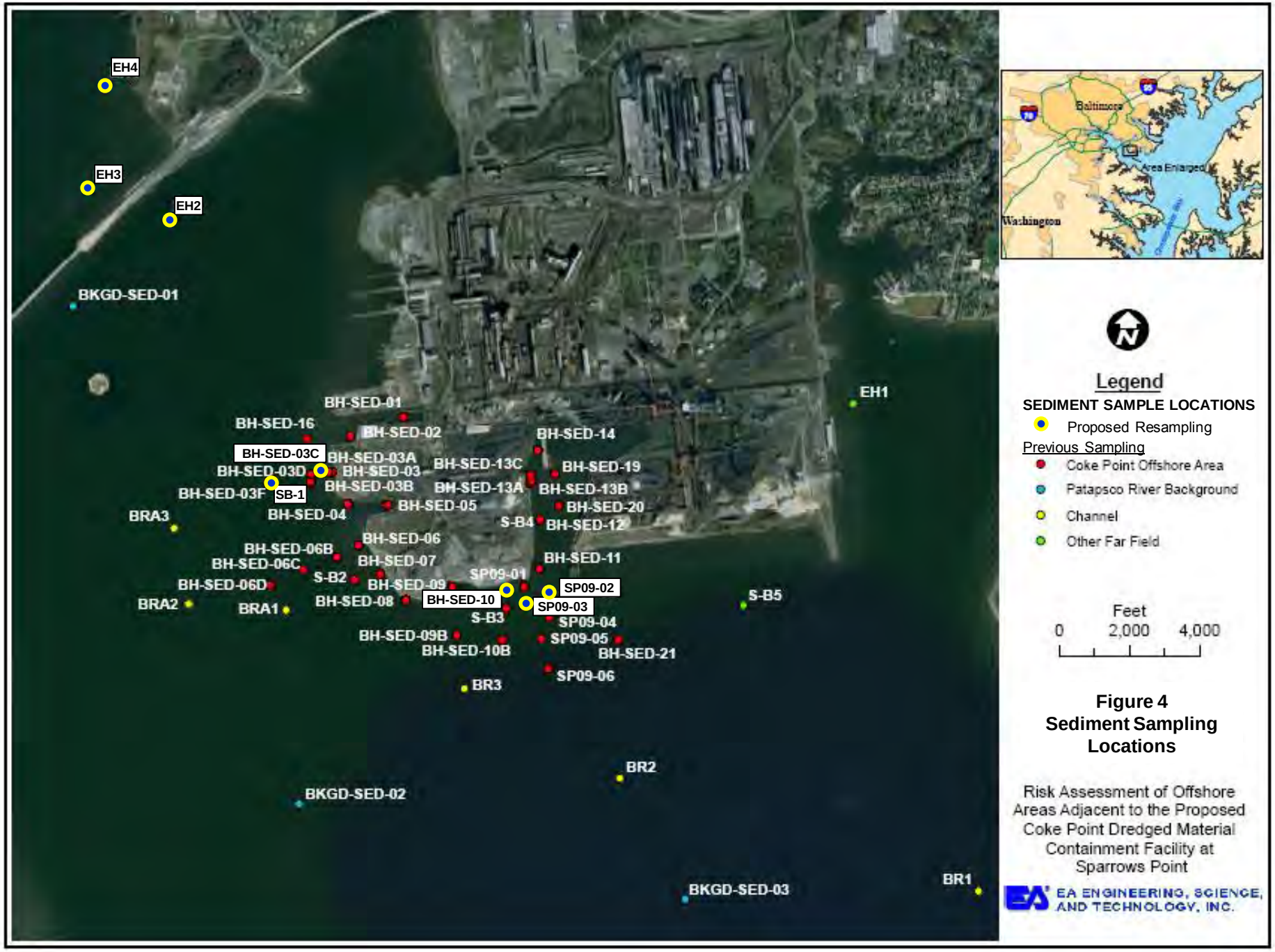

Figure 4
Sediment Sampling Locations

Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

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Tables

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Table 1. Study Design: Number of Composite Samples for Analytical Testing

Matrix		Metals	PAHs	PCBs	Arsenic Speciation	Hexavalent Chromium	Lipids
FIELD STUDIES							
Coke Point Offshore Area							
Fish Composite	Whole body*	5	5	5	2	0	5
	Fillet	5	5	5	2	0	5
Crab Composite	Meat	5	5	5	2	0	5
	Mustard	5	5	5	2	0	5
Patapsco River background area							
Fish Composite	Whole body*	5	5	5	2	0	5
	Fillet	5	5	5	2	0	5
Crab Composite	Meat	5	5	5	2	0	5
	Mustard	5	5	5	2	0	5
Field Total Samples		40	40	40	16	0	40
LABORATORY STUDIES							
Coke Point Offshore Area							
Sediment grab samples		5	5	5	0	0	0
Sediment composite		1	1	1	0	1	0
Clam		5	5	5	2	0	5
Worm		5	5	5	2	0	5
Patapsco River background area							
Sediment grab samples		3	3	3	0	0	0
Sediment composite		1	1	1	0	1	0
Clam		5	5	5	2	0	5
Worm		5	5	5	2	0	5
Control Samples (lab control and pre-test)							
Control Sediment		1	1	1	0	0	0
Clam		6	6	6	2	0	6
Worm		6	6	6	2	0	6
Lab Total Samples		43	43	43	12	2	32
Overall Total		83	83	83	28	2	72

* As available (if sample volume permits).

Table 2. Sediment and Tissue Sample Containers, Preservation Techniques, and Holding Times[a]

Parameter	Analytical Method	Mass Required (g) [b]	Container[c]	Preservative	Holding Time
FISH TISSUES					
Metals	SW846 6020	2	Plastic bag/8 oz. borosilicate glass	Frozen, ≤ -20°C	6 months
Mercury	SW846 7471A			Frozen, ≤ -20°C	28 days
Arsenic Speciation[d]	EPA 1632	5		Frozen, ≤ -20°C	6 months
PAHs	SW846 8270 SIM	30		Frozen, ≤ -20°C	1 year
PCB Congeners	SW846 8082	6		Frozen, ≤ -20°C	1 year
Lipids	TestAmerica SOP	10		Frozen, ≤ -20°C	Up to 1 year to analysis
Percent Moisture	TestAmerica SOP	5		Frozen, ≤ -20°C	Up to 1 year to analysis
CRAB TISSUES					
Metals	SW846 6020	2	Plastic bag/8 oz. borosilicate glass	Frozen, ≤ -20°C	6 months
Mercury	SW846 7471A			Frozen, ≤ -20°C	28 days
Arsenic Speciation[d]	EPA 1632	5		Frozen, ≤ -20°C	6 months
PAHs	SW846 8270 SIM	25		Frozen, ≤ -20°C	1 year
PCB Congeners	SW846 8082	6		Frozen, ≤ -20°C	1 year
Lipids	TestAmerica SOP	10		Frozen, ≤ -20°C	Up to 1 year to analysis
Percent Moisture	TestAmerica SOP	5		Frozen, ≤ -20°C	Up to 1 year to analysis

(a) From time of sample collection.
(b) Additional volume will need to be provided for samples designated as MS/MSDs
(c) If fish or fillets are to be homogenized later, they should be wrapped in heavy duty aluminum foil and placed in a plastic bag.
(d) Subcontract to Brooks Rand – total arsenic, arsenate (As5+), arsenite (As3+), monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA).

Table 2. Sediment and Tissue Sample Containers, Preservation Techniques, and Holding Times[a] (continued)

Parameter	Analytical Method	Mass Required (g) [b]	Container[c]	Preservative	Holding Time
OFFSHORE SEDIMENTS					
Semivolatiles and PAHs	SW846 8270C	30	8 oz. borosilicate glass	4±2°C	14 days (extraction) 40 days (analysis)
Metals	SW846 6020	2		4±2°C	180 days
Mercury	SW846 7471A			4±2°C	28 days
PCB Congeners	SW846 8082	6		4±2°C	14 days (extraction) 40 days (analysis)
Hexavalent Chromium (composite samples only)	TestAmerica SOP	5		4±2°C	180 days
Total Organic Carbon by Combustion	Lloyd Kahn	5		4±2°C	14 day
Grain Size (Sieve and Hydrometer)	ASTM D422	5	32 oz. borosilicate glass	4±2°C	180 days
BIOACCUMULATION TISSUE (CLAMS AND WORMS)					
Metals	SW846 6020	2	8 oz. borosilicate glass	Frozen, ≤ -20°C	6 months
Mercury	SW846 7471A			Frozen, ≤ -20°C	28 days
Arsenic Speciation[d]	EPA 1632	10		4±2°C shipped, ≤ -18°C in lab	24 months
PAHs	SW846 8270 SIM	30		Frozen, ≤ -20°C	1 year
PCB Congeners	SW846 8082	6		Frozen, ≤ -20°C	1 year
Lipids	TestAmerica SOP	10		Frozen, ≤ -20°C	Up to 1 year to analysis
Percent Moisture	TestAmerica SOP	5		Frozen, ≤ -20°C	Up to 1 year to analysis

(a) From time of sample collection.
(b) Additional volume will need to be provided for samples designated as MS/MSDs
(c) If fish or fillets are to be homogenized later, they should be wrapped in heavy duty aluminum foil and placed in a plastic bag.
(d) Subcontract to Brooks Rand – total arsenic, arsenate (As5+), arsenite (As3+), monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA).

Table 3. Analytical Project Limits

Limits for Tissue Samples	RL	Units	MDL	Units
PAHs, Low Level (SW846 8270C)				
Acenaphthene	6.7	ug/kg	1.724499	ug/kg
Acenaphthylene	6.7	ug/kg	1.929302	ug/kg
Anthracene	6.7	ug/kg	1.8824	ug/kg
Benzo(a)anthracene	6.7	ug/kg	1.311861	ug/kg
Benzo(b)fluoranthene	6.7	ug/kg	1.275441	ug/kg
Benzo(k)fluoranthene	6.7	ug/kg	1.061718	ug/kg
Benzo(ghi)perylene	6.7	ug/kg	1.12754	ug/kg
Benzo(a)pyrene	6.7	ug/kg	1.02188	ug/kg
Chrysene	6.7	ug/kg	1.314402	ug/kg
Dibenzo(a,h)anthracene	6.7	ug/kg	2.104973	ug/kg
Fluoranthene	6.7	ug/kg	2.142833	ug/kg
Fluorene	6.7	ug/kg	1.606885	ug/kg
Indeno(1,2,3-cd)pyrene	6.7	ug/kg	1.176631	ug/kg
Naphthalene	6.7	ug/kg	1.607154	ug/kg
Phenanthrene	6.7	ug/kg	1.589399	ug/kg
Pyrene	6.7	ug/kg	2.02712	ug/kg
Metals, ITM List (SW846 6020/7471A)				
Aluminum	3	mg/kg	0.236	mg/kg
Antimony	0.2	mg/kg	0.0033	mg/kg
Arsenic	0.1	mg/kg	0.0165	mg/kg
Beryllium	0.1	mg/kg	0.0037	mg/kg
Cadmium	0.1	mg/kg	0.0091	mg/kg
Chromium	0.2	mg/kg	0.008	mg/kg
Cobalt	0.05	mg/kg	0.0025	mg/kg
Copper	0.2	mg/kg	0.0085	mg/kg
Iron	5	mg/kg	0.2887	mg/kg
Lead	0.1	mg/kg	0.0034	mg/kg
Manganese	0.05	mg/kg	0.0145	mg/kg
Mercury	0.033	mg/kg	0.0109	mg/kg
Nickel	0.1	mg/kg	0.0068	mg/kg
Selenium	0.5	mg/kg	0.0406	mg/kg
Silver	0.1	mg/kg	0.0024	mg/kg
Thallium	0.1	mg/kg	0.002	mg/kg
Tin	0.5	mg/kg	0.106	mg/kg
Zinc	0.5	mg/kg	0.0117	mg/kg

Table 3. Analytical Project Limits (continued)

Limits for Tissue Samples (continued)	RL	Units	MDL	Units
PCB Congeners, ITM list (SW846 8082)				
PCB 209 (BZ)	2	ug/kg	0.7421	ug/kg
PCB 8 (BZ)	2	ug/kg	0.7285	ug/kg
PCB 187 (BZ)	2	ug/kg	0.5806	ug/kg
PCB 184 (BZ)	2	ug/kg	0.5498	ug/kg
PCB 183 (BZ)	2	ug/kg	0.8478	ug/kg
PCB 170 (BZ)	2	ug/kg	0.5996	ug/kg
PCB 180 (BZ)	2	ug/kg	0.9368	ug/kg
PCB 128 (BZ)	2	ug/kg	0.5876	ug/kg
PCB 138 (BZ)	2	ug/kg	0.5374	ug/kg
PCB 156 (BZ)	2	ug/kg	0.4535	ug/kg
PCB 169 (BZ)	2	ug/kg	0.5917	ug/kg
PCB 153 (BZ)	2	ug/kg	0.5467	ug/kg
PCB 206 (BZ)	2	ug/kg	0.7892	ug/kg
PCB 195 (BZ)	2	ug/kg	0.6879	ug/kg
PCB 101 (BZ)	2	ug/kg	0.6357	ug/kg
PCB 87 (BZ)	2	ug/kg	0.626	ug/kg
PCB 90 (BZ)	2	ug/kg	1	ug/kg
PCB 105 (BZ)	2	ug/kg	0.7544	ug/kg
PCB 118 (BZ)	2	ug/kg	0.7485	ug/kg
PCB 126 (BZ)	2	ug/kg	0.6526	ug/kg
PCB 44 (BZ)	2	ug/kg	0.823	ug/kg
PCB 66 (BZ)	2	ug/kg	0.8256	ug/kg
PCB 52 (BZ)	2	ug/kg	0.7038	ug/kg
PCB 49 (BZ)	2	ug/kg	0.6696	ug/kg
PCB 77 (BZ)	2	ug/kg	0.5755	ug/kg
PCB 18 (BZ)	2	ug/kg	0.7467	ug/kg
PCB 28 (BZ)	2	ug/kg	0.8316	ug/kg
Percent Lipids (TA SOP)	0.1	%	0.02957	%
Arsenic Speciation (EPA 1632, modified)			3	ug/kg

Limits for Sediment Samples	RL	Units	MDL	Units
Semivolatiles, ITM List (SW846 8270C)				
Acenaphthene	6.7	ug/kg	0.6408	ug/kg
Acenaphthylene	6.7	ug/kg	0.7641	ug/kg
Anthracene	6.7	ug/kg	0.6527	ug/kg
Benzo(a)anthracene	6.7	ug/kg	0.836	ug/kg
Benzo(b)fluoranthene	6.7	ug/kg	1.0488	ug/kg
Benzo(k)fluoranthene	6.7	ug/kg	1.3486	ug/kg
Benzoic acid	170	ug/kg	13.8385	ug/kg
Benzo(ghi)perylene	6.7	ug/kg	0.6637	ug/kg
Benzo(a)pyrene	6.7	ug/kg	0.6675	ug/kg
Benzyl alcohol	33	ug/kg	4.0337	ug/kg
bis(2-Chloroethoxy)methane	33	ug/kg	2.1959	ug/kg
bis(2-Chloroethyl) ether	6.7	ug/kg	0.8954	ug/kg

Table 3. Analytical Project Limits (continued)

Limits for Sediment Samples (continued)	RL	Units	MDL	Units
bis(2-Ethylhexyl) phthalate	66.7	ug/kg	5.3906	ug/kg
4-Bromophenyl phenyl ether	33	ug/kg	2.9028	ug/kg
Butyl benzyl phthalate	33	ug/kg	4.5589	ug/kg
4-Chloro-3-methylphenol	33	ug/kg	3.0707	ug/kg
2-Chloronaphthalene	6.7	ug/kg	0.6962	ug/kg
2-Chlorophenol	33	ug/kg	2.7275	ug/kg
4-Chlorophenyl phenyl ether	33	ug/kg	3.7077	ug/kg
Chrysene	6.7	ug/kg	0.7943	ug/kg
Dibenzo(a,h)anthracene	6.7	ug/kg	0.7421	ug/kg
Dibenzofuran	33	ug/kg	3.282	ug/kg
Di-n-butyl phthalate	33	ug/kg	4.1799	ug/kg
3,3'-Dichlorobenzidine	33	ug/kg	3.5266	ug/kg
2,4-Dichlorophenol	6.7	ug/kg	0.6693	ug/kg
Diethyl phthalate	33	ug/kg	3.6431	ug/kg
2,4-Dimethylphenol	33	ug/kg	5.2171	ug/kg
Dimethyl phthalate	33	ug/kg	3.6347	ug/kg
4,6-Dinitro-2-methylphenol	170	ug/kg	13.4068	ug/kg
2,4-Dinitrophenol	170	ug/kg	39.717	ug/kg
2,4-Dinitrotoluene	33	ug/kg	2.6927	ug/kg
2,6-Dinitrotoluene	33	ug/kg	3.4416	ug/kg
Di-n-octyl phthalate	33	ug/kg	3.5151	ug/kg
1,2-Diphenylhydrazine	33	ug/kg	4.2709	ug/kg
Fluoranthene	6.7	ug/kg	0.7134	ug/kg
Fluorene	6.7	ug/kg	0.8793	ug/kg
Hexachlorobenzene	6.7	ug/kg	0.7107	ug/kg
Hexachlorobutadiene	6.7	ug/kg	0.7465	ug/kg
Hexachlorocyclopentadiene	33	ug/kg	3.5973	ug/kg
Hexachloroethane	33	ug/kg	2.3986	ug/kg
Indeno(1,2,3-cd)pyrene	6.7	ug/kg	0.6874	ug/kg
Isophorone	33	ug/kg	2.5145	ug/kg
2-Methylnaphthalene	6.7	ug/kg	0.5999	ug/kg
1-Methylnaphthalene	6.7	ug/kg	0.7119	ug/kg
2-Methylphenol	33	ug/kg	2.331	ug/kg
4-Methylphenol	33	ug/kg	3.2652	ug/kg
Naphthalene	6.7	ug/kg	0.575	ug/kg
Nitrobenzene	66.7	ug/kg	2.7772	ug/kg
2-Nitrophenol	33	ug/kg	3.6772	ug/kg
4-Nitrophenol	170	ug/kg	11.379	ug/kg
N-Nitrosodimethylamine	33	ug/kg	2.8604	ug/kg
N-Nitrosodiphenylamine	33	ug/kg	3.088	ug/kg
N-Nitrosodi-n-propylamine	6.7	ug/kg	0.7824	ug/kg
2,2'-oxybis(1-Chloropropane)	6.7	ug/kg	0.7201	ug/kg
Pentachlorophenol	33	ug/kg	2.9832	ug/kg
Phenanthrene	6.7	ug/kg	1.0612	ug/kg
Phenol	6.7	ug/kg	0.7883	ug/kg
Pyrene	6.7	ug/kg	0.6746	ug/kg

Table 3. Analytical Project Limits (continued)

Limits for Sediment Samples (continued)	RL	Units	MDL	Units
1,2,4-Trichlorobenzene	33	ug/kg	1.8452	ug/kg
2,4,6-Trichlorophenol	33	ug/kg	4.9941	ug/kg
Metals, ITM List (SW846 6020/7471A)				
Aluminum	3	mg/kg	0.2849	mg/kg
Antimony	0.2	mg/kg	0.0026	mg/kg
Arsenic	0.1	mg/kg	0.0181	mg/kg
Beryllium	0.1	mg/kg	0.0075	mg/kg
Cadmium	0.1	mg/kg	0.007	mg/kg
Chromium	0.2	mg/kg	0.0061	mg/kg
Cobalt	0.05	mg/kg	0.0015	mg/kg
Copper	0.2	mg/kg	0.033	mg/kg
Iron	5	mg/kg	0.3539	mg/kg
Lead	0.1	mg/kg	0.0038	mg/kg
Manganese	0.05	mg/kg	0.0103	mg/kg
Mercury	0.033	mg/kg	0.0109	mg/kg
Nickel	0.1	mg/kg	0.0113	mg/kg
Selenium	0.5	mg/kg	0.0502	mg/kg
Silver	0.1	mg/kg	0.0039	mg/kg
Thallium	0.1	mg/kg	0.002	mg/kg
Tin	0.5	mg/kg	0.0593	mg/kg
Zinc	0.5	mg/kg	0.0648	mg/kg
PCB Congeners, ITM List (SW846 8082)				
PCB 209 (BZ)	0.17	ug/kg	0.03587	ug/kg
PCB 8 (BZ)	0.17	ug/kg	0.03472	ug/kg
PCB 187 (BZ)	0.17	ug/kg	0.03539	ug/kg
PCB 184 (BZ)	0.17	ug/kg	0.02881	ug/kg
PCB 183 (BZ)	0.17	ug/kg	0.03331	ug/kg
PCB 170 (BZ)	0.17	ug/kg	0.03439	ug/kg
PCB 180 (BZ)	0.17	ug/kg	0.03415	ug/kg
PCB 128 (BZ)	0.17	ug/kg	0.03434	ug/kg
PCB 138 (BZ)	0.17	ug/kg	0.0359	ug/kg
PCB 156 (BZ)	0.17	ug/kg	0.03393	ug/kg
PCB 169 (BZ)	0.17	ug/kg	0.03292	ug/kg
PCB 153 (BZ)	0.17	ug/kg	0.03475	ug/kg
PCB 206 (BZ)	0.17	ug/kg	0.03347	ug/kg
PCB 195 (BZ)	0.17	ug/kg	0.03384	ug/kg
PCB 101 (BZ)	0.17	ug/kg	0.03371	ug/kg
PCB 87 (BZ)	0.17	ug/kg	0.03119	ug/kg
PCB 90 (BZ)	0.17	ug/kg	0.02556	ug/kg
PCB 105 (BZ)	0.17	ug/kg	0.03498	ug/kg
PCB 118 (BZ)	0.17	ug/kg	0.03414	ug/kg
PCB 126 (BZ)	0.17	ug/kg	0.0439	ug/kg
PCB 44 (BZ)	0.17	ug/kg	0.03442	ug/kg
PCB 66 (BZ)	0.17	ug/kg	0.02735	ug/kg

Table 3. Analytical Project Limits (continued)

Limits for Sediment Samples (continued)	RL	Units	MDL	Units
PCB 52 (BZ)	0.17	ug/kg	0.03325	ug/kg
PCB 49 (BZ)	0.17	ug/kg	0.03529	ug/kg
PCB 77 (BZ)	0.17	ug/kg	0.03654	ug/kg
PCB 18 (BZ)	0.17	ug/kg	0.02293	ug/kg
PCB 28 (BZ)	0.17	ug/kg	0.03747	ug/kg
Hexavalent Chromium (SW846 7196A)	0.4	mg/kg	0.109	mg/kg
TOC (Lloyd Kahn)	1000	mg/kg	272.35	mg/kg

RL = Reporting Limit
MDL = Method Detection Limit
* Laboratory limits are subject to periodic change as MDLs are updated
* Laboratory limits are based on wet weight. Tissue samples will be reported on a wet weight basis.
* Laboratory limits will be adjusted accordingly based on initial sample volume, final extract volume, and any necessary dilutions.

Table 4
Highest Detected Chemical Concentrations for Select Analytes in Previously Collected Samples

SAMPLE	ARSENIC	CHROMIUM	COBALT	COPPER	IRON	LEAD	MANGANESE	ZINC	BENZO(A)PYRENE	DIBENZO(A,H)ANTHRACENE	HMW PAHS	LMW PAHS	NAPHTHALENE	TOTAL PCBS
RME EPC	**27.6**	**236**	**29.4**	**172**	**76400**	**351**	**1270**	**999**	**12.5**	**2.46**	**86.5**	**2200**	**2150**	**0.265**
BH-SED-01	17.2	249	--	139	--	175	--	861	1.1	0.19	7.28	6.933	3.7	--
BH-SED-02	4.5	105	--	50.1	--	68.4	--	373	9.3	1.3	61.6	142.3	85	0.055
BH-SED-03A	9.8	120	--	44.5	--	65.8	--	279	5.3	0.13	32.1	109.6	90	--
BH-SED-03B	25.2	296	--	177	--	373	--	1070	9.9	0.9	73.9	7280	7200	0.097
BH-SED-03C	*50.1*	*450*	--	*595*	--	*602*	--	*1790*	*10*	*1.9*	*69*	*237.7*	*190*	*0.274*
BH-SED-03F	44.3	504	27.2	307	86400	341	844	1160	4.3	0.65	26.35	10.76	5	0.283
BH-SED-04	21.4	376	--	81.7	--	216	--	838	6	0.89	35.39	122.6	97	0.065
BH-SED-05	9.4	138	--	51.7	--	70.6	--	418	26	0.13	267	190.3	50	--
BH-SED-06	19.2	180	--	97.3	--	166	--	498	26	6.3	214.3	115.3	20	0.096
BH-SED-06B	26.2	290	23.7	173	72000	231	869	777	3.6	0.57	22.07	11.56	6	0.12
BH-SED-06C	23.9	220	21.8	105	54100	160	865	518	4.4	0.6	27.7	8.549	2.5	0.079
BH-SED-06D	18.9	111	15.7	71	33500	101	675	329	1.9	0.2	9	3.285	0.79	0.028
BH-SED-07	22.9	261	--	87.7	--	208	--	617	56	4.3	288.3	206.7	14	--
BH-SED-08	20	283	--	129	--	171	--	597	8.8	1.5	57.8	37.64	12	--
BH-SED-09	12.5	156	--	60.4	--	146	--	619	25	4.9	143.9	63.16	13	--
BH-SED-09B	14.6	145	23.1	80.1	53000	132	1220	485	3.4	0.62	22.22	15.86	7.4	0.047
BH-SED-10	*46.8*	*200*	--	*130*	--	*1150*	--	*2730*	*15*	*2.6*	*104*	*59.97*	*9.9*	*0.017*
BH-SED-10B	14.6	144	26.5	81.7	61300	141	1310	525	2.5	0.54	17.54	11.97	5.2	0.03
BH-SED-11	34.1	235	--	275	--	567	--	1400	12	1.9	82.2	79.66	37	0.137
BH-SED-12	12.6	107	--	75.5	--	268	--	609	5.5	1	35.6	17.79	5.3	--
BH-SED-13A	7.8	178	--	30.9	--	87.2	--	150	3.6	0.53	26.33	41.64	16	--
BH-SED-13B	13.6	127	--	80.6	--	167	--	479	0.63	0.086	5.436	4.478	1.7	0.006
BH-SED-13C	14.8	124	--	87.7	--	169	--	495	0.32	0.3	3.36	2.309	0.77	--
BH-SED-14	13.3	137	--	89.6	--	166	--	511	0.73	0.12	6.6	5.7	1.5	--
BH-SED-19	15.9	117	26.4	84.4	58100	171	1590	593	0.46	0.21	3.58	2.898	0.91	0.038
BH-SED-20	17.1	118.5	27.95	79.4	58050	159.5	1440	519.5	1.155	0.34	8.185	5.228	1.9	0.033
BH-SED-21	14.1	114	26.5	68.4	51800	114	1220	410	0.32	0.14	2.47	1.98	0.76	0.036
SB-1	*42.5*	*391*	*25.6*	*305*	*91900*	*470*	*1590*	*1430*	*9.6*	*1.9*	*66.4*	*100.4*	*55*	*0.46*
SB-2	30.4	241	26.2	216	66000	197	990	628	2.1	0.36	12.56	5.786	1.8	0.176
SB-3	28.6	195	30.8	200	62000	300	1370	928	20	4.1	140.1	93.98	21	0.207
SB-4	14.6	93.1	20.2	79.8	44600	298	1160	668	6.5	1.9	40.1	20.18	4.4	0.081
SP09-01	8.2	42	13.5	27.4	28700	43	819	99.5	0.61	0.11	4.15	2.307	0.46	0
SP09-02	*72*	*262*	*25.5*	*193*	*1E+05*	*1280*	*1090*	*2250*	*27*	*4.6*	*216.6*	*242.3*	*52*	*0.155*
SP09-03	*52.2*	*362*	*53*	*431*	*1E+05*	*588*	*1520*	*1570*	*12*	*1.8*	*85.1*	*103.7*	*55*	*0.451*
SP09-04	31.6	192	27.8	157	88200	327	1090	936	5.5	0.88	35.08	17.39	3.4	0.446
SP09-05	17.6	146	27.6	82.2	70300	152	1160	478	1.9	0.37	12.07	7.91	3.4	0.098
SP09-06	22.2	159	27	82	58600	146	1260	498	1.9	0.26	11.81	5.745	1.3	0.119

Gray – Samples with the 5 concentrations immediately lower than the EPC.
Yellow – Samples with the 5 concentrations immediately higher than the EPC.
Orange – Samples with the highest concentrations.
Bold italicized sample names are those selected for discrete sediment sampling in this study.
RME EPC = Reasonable Maximum Estimate Exposure Point Concentration

Table 5
Discrete Sediment Sample Coordinates

Sample	X-coordinate	Y-coordinate
Coke Point Offshore Area		
BH-SED-03C-00-10A	1453539.000090	562223.300018
BH-SED-10-00-10A	1457597.800000	559612.000000
SB-1-00-10A	1453271.789990	561991.620035
SP09-02-00-10A	1458578.699980	559564.499889
SP09-03-00-10A	1458035.600020	559304.600146
Patapsco River Background Area		
EH2-00-10	1450130.859920	567745.870009
EH3-00-10	1448332.629920	568427.470024
EH4-00-10	1448679.310010	570716.590118

APPENDIX A:

FIELD FORMS

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Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** _____

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: **[ ] CP – Coke Point Offshore Area** **[ ] PR – Patapsco River Background Area**

Specific Collection Location Description:_____

_____

Collection Method: **[ ]** Otter Trawl **[ ]** Crab Trap **[ ]** Hand Collected
[ ] Jug Line **[ ]** Crab Pot **[ ]** Other_____

Collector(s) Name(s): _____
(Print and sign)
_____

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes

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Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** _____

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area **[ ] PR – Patapsco River Background Area**

Species:_____

Preparer(s) Name(s): _____
(Print and sign)
_____

COMPOSITE NAME:_____
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

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APPENDIX B:

SCIENTIFIC COLLECTION PERMIT

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MARYLAND DEPARTMENT OF NATURAL RESOURCES

FISHERIES SERVICE — AMENDED

SCIENTIFIC COLLECTION PERMIT — 09-27-2010

1. PERMITTEE EA ENGINEERING, SCIENCE & TECHNOLOGY, INC. 15 LOVETON CIRCLE SPARKS, MD 21152	2. PERMIT NUMBER **SCP201091A** 3. EFFECTIVE AMENDED 09-27-2010 4. EXPIRES 12-31-2010 5. PHONE 410-771-4950 x5363 (WORK) E-MAIL rballant@eaest.com

6. NAME AND TITLE OF PRINCIPAL OFFICER ROBERT BALLANTINE

7. CONDITIONS AND AUTHORIZATIONS:

A. THE ANNOTATED CODE OF MARYLAND, §4-212, STATES THAT THE SECRETARY OF THE DEPARTMENT OF NATURAL RESOURCES MAY GRANT CERTIFICATES TO ACCREDITED PERSONS OF SCIENTIFIC INSTITUTIONS TO PERMIT THEM TO COLLECT FISH, FISH EGGS, CRUSTACEANS, AND MOLLUSKS FOR SCIENTIFIC PURPOSES. THE CONDITIONS IN STATE LAW AND REGULATIONS ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, FEDERAL, LOCAL OR OTHER STATE LAWS.

C. YOU MUST REPORT THE COLLECTION OF ANY MARKED FISH TO THE APPROPRIATE AGENCY. MARKINGS MAY INCLUDE FIN CLIPS, STREAMER OR FLOY TAGS, ETC. THIS INFORMATION IS REQUIRED SINCE THE REGIONAL MANAGERS PERIODICALLY CONDUCT MARK-RECAPTURE POPULATION SURVEYS IN THE AREA.

D. YOU MUST CONTACT THE DEPARTMENT OF NATURAL RESOURCES POLICE AT (410) 260-8940 TO LET THEM KNOW WHEN YOU WILL BE OPERATING IN MARYLAND WATERS. THIS ELIMINATES THE NECESSITY OF CONFIRMING ANY CALLS RELATED TO YOUR COLLECTION ACTIVITIES.

E. THIS PERMIT DOES NOT AUTHORIZE THE COLLECTION, SALVAGE, POSSESSION OR TRANSPORTATION OF ANY SPECIES CLASSIFIED AS THREATENED OR ENDANGERED AT THE STATE OR FEDERAL LEVEL (EXCEPT AS LISTED BELOW).

F. **STUDY SPECIFICS:** COLLECTION OF FISH AND CRABS FROM THE AREA SURROUNDING COKE POINT AND A CONTROL AREA SURROUNDING SOLLER'S POINT FOR THE PURPOSES OF A CONTAMINENT STUDY.

G. SPECIES RESTRICTIONS: A DAILY MAXIMUM OF NINETY CRABS AND NINETY FISH MAY BE COLLECTED WITHIN THESE TWO STUDY AREAS. NO STRIPED BASS ARE PERMITTED. ALL OTHER FISH OR CRABS MUST BE RELEASED LIVE.

H. OTTER TRAWL RESTRICTIONS: TRAWL TIMES MUST BE LIMITED TO A TOW OF FIVE MINUTES OR LESS AT EACH SAMPLING SITE WITHIN THE COLLECTION AREAS, TO REDUCE BYCATCH.

I. CRAB POT RESTRICTIONS: CRAB POTS ARE PROHIBITED TO BE SET IN RIVERS, SET IN THE BAY ONLY. CRAB POTS MAY BE USED WHERE OTHERWISE LEGAL, INCLUDING AS ATTACHED TO PIERS. ALL TRAPS MUST HAVE FLOATS MARKED WITH THE COLLECTOR'S NAME, CONTACT NUMBER AND "SC".

J. SAMPLING AND COLLECTION ARE PROHIBITED FROM SUBMERGED AQUATIC VEGETATION BEDS.

K. COLLECTION OF FISH AND CRABS USING CRAB POTS, CRAB TROTLINES, JUG & LINE, HOOK & LINE AND AN OTTER TRAWL IS PERMITTED **ACCORDING TO SECTIONS 7A-J (SEE ABOVE)** WITHIN 2000 FEET OF THE SHORELINE SURROUNDING SOLLER'S POINT (CONTROL AREA) AND WITHIN 2000 FEET OF THE SHORELINE SURROUNDING COKE POINT IN THE PATAPSCO RIVER FOR THE PURPOSES OF A CONTAMINENT STUDY.

L. SPECIES COLLECTED AND/OR HELD UNDER THIS PERMIT ARE NOT PERMITTED FOR PERSONAL CONSUMPTION OR SALE.

8. LIST OF COLLECTORS IN ADDITION TO PRINCIPAL OFFICER (each collector must carry a copy of this permit)

ADAM KUMIN JON KIMCHI DAVE IVY ERIN MARKEL

9. REPORTING REQUIREMENTS: SUMMARY REPORT OF PERMIT ACTIVITY DUE BY JANUARY 31, 2011

ISSUED BY Richard Bohn PERMIT COORDINATOR 410-260-8317	ISSUED AMENDED 09-27-2010

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APPENDIX C:

SEDIMENT AND TISSUE SAMPLES

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Appendix C

Table 1. Specimens for Tissue Sampling to be Collected During Field Studies

Sample	Media*	Area	Taxonomic identification; length and mass measurement
EA Samples			
CP-ICPU-001	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-002	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-003	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-004	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-005	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-006	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-007	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-008	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-009	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-010	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-011	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-012	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-013	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-014	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-015	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-016	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-017	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-018	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-019	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-020	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-021	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-022	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-023	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-024	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-025	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-026	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-027	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-028	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-029	Fish - White Perch	Coke Point Offshore Area	x
CP-ICPU-030	Fish - White Perch	Coke Point Offshore Area	x
PR-ICPU-001	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-002	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-003	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-004	Fish - White Perch	Patapsco River Background Area	x

Appendix C

Table 1. Specimens for Tissue Sampling to be Collected During Field Studies

Sample	Media*	Area	Taxonomic identification; length and mass measurement
EA Samples			
PR-ICPU-005	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-006	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-007	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-008	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-009	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-010	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-011	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-012	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-013	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-014	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-015	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-016	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-017	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-018	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-019	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-020	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-021	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-022	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-023	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-024	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-025	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-026	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-027	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-028	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-029	Fish - White Perch	Patapsco River Background Area	x
PR-ICPU-030	Fish - White Perch	Patapsco River Background Area	x
PR-CASA-001	Blue Crab	Patapsco River Background Area	x
PR-CASA-002	Blue Crab	Patapsco River Background Area	x
PR-CASA-003	Blue Crab	Patapsco River Background Area	x
PR-CASA-004	Blue Crab	Patapsco River Background Area	x
PR-CASA-005	Blue Crab	Patapsco River Background Area	x
PR-CASA-006	Blue Crab	Patapsco River Background Area	x
PR-CASA-007	Blue Crab	Patapsco River Background Area	x
PR-CASA-008	Blue Crab	Patapsco River Background Area	x

Appendix C

Table 1. Specimens for Tissue Sampling to be Collected During Field Studies

Sample	Media*	Area	Taxonomic identification; length and mass measurement
EA Samples			
PR-CASA-009	Blue Crab	Patapsco River Background Area	x
PR-CASA-010	Blue Crab	Patapsco River Background Area	x
PR-CASA-011	Blue Crab	Patapsco River Background Area	x
PR-CASA-012	Blue Crab	Patapsco River Background Area	x
PR-CASA-013	Blue Crab	Patapsco River Background Area	x
PR-CASA-014	Blue Crab	Patapsco River Background Area	x
PR-CASA-015	Blue Crab	Patapsco River Background Area	x
CP-CASA-001	Blue Crab	Coke Point Offshore Area	x
CP-CASA-002	Blue Crab	Coke Point Offshore Area	x
CP-CASA-003	Blue Crab	Coke Point Offshore Area	x
CP-CASA-004	Blue Crab	Coke Point Offshore Area	x
CP-CASA-005	Blue Crab	Coke Point Offshore Area	x
CP-CASA-006	Blue Crab	Coke Point Offshore Area	x
CP-CASA-007	Blue Crab	Coke Point Offshore Area	x
CP-CASA-008	Blue Crab	Coke Point Offshore Area	x
CP-CASA-009	Blue Crab	Coke Point Offshore Area	x
CP-CASA-010	Blue Crab	Coke Point Offshore Area	x
CP-CASA-011	Blue Crab	Coke Point Offshore Area	x
CP-CASA-012	Blue Crab	Coke Point Offshore Area	x
CP-CASA-013	Blue Crab	Coke Point Offshore Area	x
CP-CASA-014	Blue Crab	Coke Point Offshore Area	x
CP-CASA-015	Blue Crab	Coke Point Offshore Area	x

*Alternate species will also be collected and labeled appropriately.

Appendix C
Table 2. Tissue Composites to be Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
EA Samples								
CP-ICPU-WB-A	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-ICPU-WB-B	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-ICPU-WB-C	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-ICPU-WB-D	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-ICPU-WB-E	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-ICPU-WB-EMS	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-ICPU-WB-EMSD	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-ICPU-FT-A	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-ICPU-FT-B	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-ICPU-FT-C	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-ICPU-FT-D	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-ICPU-FT-E	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-ICPU-FT-EMS	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	
CP-ICPU-FT-EMSD	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MT-A	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-B	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-C	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-D	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-E	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-EMS	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MT-EMSD	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-A	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-B	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-C	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-D	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-E	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-EMS	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-EMSD	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
PR-ICPU-WB-A	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-ICPU-WB-B	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-ICPU-WB-C	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-ICPU-WB-D	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-ICPU-WB-E	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-ICPU-FT-A	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-ICPU-FT-B	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-ICPU-FT-C	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-ICPU-FT-D	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-ICPU-FT-E	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-A	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x

Appendix C
Table 2. Tissue Composites to be Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
PR-CASA-MT-B	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MT-C	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-D	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-E	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-A	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-B	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-C	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-D	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-E	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
RB######	Rinse blank	Rinsate	Quality Control	x	x	x		
Field Total				48	48	48	24	40
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-3	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-4	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Fish Composite	Whole body	Laboratory Control	x	x	x	x	
LABDUP2	Fish Composite	Fillet (by lab)	Laboratory Control	x	x	x	x	
LABDUP3	Crab Composite	Meat	Laboratory Control	x	x	x	x	
LABDUP4	Crab Composite	Mustard	Laboratory Control	x	x	x	x	
Field Total				8	4	4	4	0
Total				**56**	**52**	**52**	**28**	**40**

Appendix C
Table 3. Sediment Samples to be Collected During Field Studies

Sample	Media	Type	Area	Metals (SW846 6020, SW846 7471A)	SVOCs & PAHs (SW846 8270)	PCB Congeners (SW846 8082)	Grain size (ASTM D422)	TOC (Lloyd Kahn)	Hexavalent Chromium
EA Samples									
BH-SED-03C-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-03-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
BH-SED-10-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-02-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
S-B1-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
CP-SED-COMP	Sediment	Composite	Coke Point Offshore Area	x	x	x	x		x
CP-SED-COMP-MS	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
CP-SED-COMP-MSD	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
EH2-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH3-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH4-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
PR-SED-COMP	Sediment	Composite	Patapsco River Background Area	x	x	x	x		x
LAB-SED-COMP	Sediment	Control	Control Sample (lab control & pre-test)	x	x	x	x		
RB######	Rinsate	Rinse blank	Quality Control	x	x	x			
Lab Total				13	13	13	11	0	4
Lab Samples									
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
Field Total				2	2	2	0	0	0
Total				**15**	**15**	**15**	**11**	**0**	**4**

Appendix C
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
EA Samples								
CP-CLAM-01	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-01MS	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-01MSD	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-02	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-03	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-04	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-05	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-01	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-01MS	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-01MSD	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-02	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-03	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-04	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-05	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
PR-CLAM-01	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-02	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-03	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-04	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-05	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-01	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-02	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-03	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-04	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-05	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PRETEST-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
PRETEST-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x

Appendix C
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
PRETEST-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
Lab Total				36	36	36	16	32
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Clam	Control	Laboratory Control					x
LABDUP2	Worm	Control	Laboratory Control					x
Field Total				2	0	0	0	2
Total				**38**	**36**	**36**	**16**	**34**

ATTACHMENT B:

SEDIMENT AND TISSUE SAMPLES

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Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
CP-MOAM-001	Fish - White Perch	Coke Point Offshore Area	9/21/2010	194	100	CP-MOAM-WB-C
CP-MOAM-002	Fish - White Perch	Coke Point Offshore Area	9/21/2010	200	108	CP-MOAM-WB-E
CP-MOAM-003	Fish - White Perch	Coke Point Offshore Area	9/21/2010	186	94	CP-MOAM-WB-B
CP-MOAM-004	Fish - White Perch	Coke Point Offshore Area	9/21/2010	212	145	CP-MOAM-FT-B
CP-MOAM-005	Fish - White Perch	Coke Point Offshore Area	9/21/2010	217	154	CP-MOAM-FT-C
CP-MOAM-006	Fish - White Perch	Coke Point Offshore Area	9/21/2010	207	129	CP-MOAM-FT-B
CP-MOAM-007	Fish - White Perch	Coke Point Offshore Area	9/21/2010	225	179	CP-MOAM-FT-E
CP-MOAM-008	Fish - White Perch	Coke Point Offshore Area	9/21/2010	223	161	CP-MOAM-FT-D
CP-MOAM-009	Fish - White Perch	Coke Point Offshore Area	9/21/2010	213	154	CP-MOAM-FT-C
CP-MOAM-010	Fish - White Perch	Coke Point Offshore Area	9/21/2010	191	98	CP-MOAM-WB-B
CP-MOAM-011	Fish - White Perch	Coke Point Offshore Area	9/21/2010	200	115	CP-MOAM-WB-E
CP-MOAM-012	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	100	CP-MOAM-WB-C
CP-MOAM-013	Fish - White Perch	Coke Point Offshore Area	9/21/2010	176	80	CP-MOAM-WB-A
CP-MOAM-014	Fish - White Perch	Coke Point Offshore Area	9/21/2010	174	76	CP-MOAM-WB-A
CP-MOAM-015	Fish - White Perch	Coke Point Offshore Area	9/21/2010	182	90	CP-MOAM-WB-A
CP-MOAM-016	Fish - White Perch	Coke Point Offshore Area	9/21/2010	210	148	CP-MOAM-FT-B
CP-MOAM-017	Fish - White Perch	Coke Point Offshore Area	9/21/2010	220	150	CP-MOAM-FT-D
CP-MOAM-018	Fish - White Perch	Coke Point Offshore Area	9/21/2010	217	144	CP-MOAM-FT-D
CP-MOAM-019	Fish - White Perch	Coke Point Offshore Area	9/21/2010	216	163	CP-MOAM-FT-C
CP-MOAM-020	Fish - White Perch	Coke Point Offshore Area	9/21/2010	235	184	CP-MOAM-FT-E
CP-MOAM-021	Fish - White Perch	Coke Point Offshore Area	9/21/2010	238	209	CP-MOAM-FT-E
CP-MOAM-022	Fish - White Perch	Coke Point Offshore Area	9/21/2010	197	104	CP-MOAM-WB-D
CP-MOAM-023	Fish - White Perch	Coke Point Offshore Area	9/21/2010	196	115	CP-MOAM-WB-D
CP-MOAM-024	Fish - White Perch	Coke Point Offshore Area	9/21/2010	195	119	CP-MOAM-WB-D
CP-MOAM-025	Fish - White Perch	Coke Point Offshore Area	9/21/2010	190	87	CP-MOAM-WB-B
CP-MOAM-026	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	97	CP-MOAM-WB-C
CP-MOAM-027	Fish - White Perch	Coke Point Offshore Area	9/21/2010	197	108	CP-MOAM-WB-E
CP-MOAM-028	Fish - White Perch	Coke Point Offshore Area	9/21/2010	206	126	CP-MOAM-FT-A*
CP-MOAM-029	Fish - White Perch	Coke Point Offshore Area	9/21/2010	205	128	CP-MOAM-FT-A*
CP-MOAM-030	Fish - White Perch	Coke Point Offshore Area	9/21/2010	206	123	CP-MOAM-FT-A*
CP-MOAM-031	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	109	CP-MOAM-FT-A
CP-MOAM-032	Fish - White Perch	Coke Point Offshore Area	9/21/2010	198	122	CP-MOAM-FT-A
CP-MOAM-033	Fish - White Perch	Coke Point Offshore Area	9/21/2010	211	138	CP-MOAM-FT-A
PR-MOAM-001	Fish - White Perch	Patapsco River Background Area	9/23/2010	190	120	PR-MOAM-WB-D
PR-MOAM-002	Fish - White Perch	Patapsco River Background Area	9/23/2010	211	132	PR-MOAM-FT-B
PR-MOAM-003	Fish - White Perch	Patapsco River Background Area	9/23/2010	170	69	PR-MOAM-WB-A
PR-MOAM-004	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	81	PR-MOAM-WB-B
PR-MOAM-005	Fish - White Perch	Patapsco River Background Area	9/23/2010	255	257	PR-MOAM-FT-E
PR-MOAM-006	Fish - White Perch	Patapsco River Background Area	9/23/2010	213	155	PR-MOAM-FT-B
PR-MOAM-007	Fish - White Perch	Patapsco River Background Area	9/23/2010	209	113	PR-MOAM-FT-A
PR-MOAM-008	Fish - White Perch	Patapsco River Background Area	9/23/2010	171	67	PR-MOAM-WB-A
PR-MOAM-009	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	78	PR-MOAM-WB-B
PR-MOAM-010	Fish - White Perch	Patapsco River Background Area	9/23/2010	193	111	PR-MOAM-WB-D
PR-MOAM-011	Fish - White Perch	Patapsco River Background Area	9/23/2010	254	256	PR-MOAM-FT-E
PR-MOAM-012	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	77	PR-MOAM-WB-C
PR-MOAM-013	Fish - White Perch	Patapsco River Background Area	9/24/2010	217	180	PR-MOAM-FT-C
PR-MOAM-014	Fish - White Perch	Patapsco River Background Area	9/24/2010	175	101	PR-MOAM-WB-C
PR-MOAM-015	Fish - White Perch	Patapsco River Background Area	9/24/2010	174	86	PR-MOAM-WB-A
PR-MOAM-016	Fish - White Perch	Patapsco River Background Area	9/24/2010	178	95	PR-MOAM-WB-C
PR-MOAM-017	Fish - White Perch	Patapsco River Background Area	9/24/2010	174	87	PR-MOAM-WB-B
PR-MOAM-018	Fish - White Perch	Patapsco River Background Area	9/29/2010	227	176	PR-MOAM-WB-E
PR-MOAM-019	Fish - White Perch	Patapsco River Background Area	9/29/2010	243	227	PR-MOAM-WB-E
PR-MOAM-020	Fish - White Perch	Patapsco River Background Area	9/29/2010	210	146	PR-MOAM-FT-A
PR-MOAM-021	Fish - White Perch	Patapsco River Background Area	9/29/2010	212	148	PR-MOAM-FT-B
PR-MOAM-022	Fish - White Perch	Patapsco River Background Area	9/29/2010	224	187	PR-MOAM-FT-D
PR-MOAM-023	Fish - White Perch	Patapsco River Background Area	9/29/2010	215	147	PR-MOAM-FT-C
PR-MOAM-024	Fish - White Perch	Patapsco River Background Area	9/29/2010	247	231	PR-MOAM-WB-E
PR-MOAM-025	Fish - White Perch	Patapsco River Background Area	9/29/2010	254	253	PR-MOAM-FT-E
PR-MOAM-026	Fish - White Perch	Patapsco River Background Area	9/29/2010	217	172	PR-MOAM-FT-C
PR-MOAM-027	Fish - White Perch	Patapsco River Background Area	9/29/2010	219	142	PR-MOAM-FT-D
PR-MOAM-028	Fish - White Perch	Patapsco River Background Area	9/29/2010	222	183	PR-MOAM-FT-D
PR-MOAM-029	Fish - White Perch	Patapsco River Background Area	9/29/2010	204	137	PR-MOAM-FT-A
PR-MOAM-030	Fish - White Perch	Patapsco River Background Area	9/29/2010	200	121	PR-MOAM-WB-D
PR-MOAM-031	Fish - White Perch	Patapsco River Background Area	9/29/2010	198	--	PR-MOAM-FT-E-MS/MSD
PR-MOAM-032	Fish - White Perch	Patapsco River Background Area	9/29/2010	182	--	PR-MOAM-FT-E-MS/MSD
PR-MOAM-033	Fish - White Perch	Patapsco River Background Area	9/29/2010	195	--	PR-MOAM-FT-E-MS/MSD

Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
PR-CASA-001	Blue Crab	Patapsco River Background Area	10/5/2010	149	162	PR-CASA-MT-A, MU-A
PR-CASA-002	Blue Crab	Patapsco River Background Area	10/5/2010	153	185	PR-CASA-MT-A, MU-A
PR-CASA-003	Blue Crab	Patapsco River Background Area	10/5/2010	135	130	PR-CASA-MT-A, MU-A
PR-CASA-004	Blue Crab	Patapsco River Background Area	10/5/2010	130	127	PR-CASA-MT-A, MU-A
PR-CASA-005	Blue Crab	Patapsco River Background Area	10/5/2010	134	130	PR-CASA-MT-A, MU-A
PR-CASA-006	Blue Crab	Patapsco River Background Area	10/5/2010	124	126	PR-CASA-MT-A, MU-A
PR-CASA-007	Blue Crab	Patapsco River Background Area	10/5/2010	140	119	PR-CASA-MT-B, MU-B
PR-CASA-008	Blue Crab	Patapsco River Background Area	10/5/2010	153	231	PR-CASA-MT-B, MU-B
PR-CASA-009	Blue Crab	Patapsco River Background Area	10/5/2010	154	232	PR-CASA-MT-B, MU-B
PR-CASA-010	Blue Crab	Patapsco River Background Area	10/5/2010	153	180	PR-CASA-MT-B, MU-B
PR-CASA-011	Blue Crab	Patapsco River Background Area	10/5/2010	171	221	PR-CASA-MT-B, MU-B
PR-CASA-012	Blue Crab	Patapsco River Background Area	10/5/2010	143	136	PR-CASA-MT-B, MU-B
PR-CASA-013	Blue Crab	Patapsco River Background Area	10/5/2010	164	187	PR-CASA-MT-C, MU-C
PR-CASA-014	Blue Crab	Patapsco River Background Area	10/5/2010	155	152	PR-CASA-MT-C, MU-C
PR-CASA-015	Blue Crab	Patapsco River Background Area	10/5/2010	153	149	PR-CASA-MT-C, MU-C
PR-CASA-016	Blue Crab	Patapsco River Background Area	10/5/2010	161	165	PR-CASA-MT-C, MU-C
PR-CASA-017	Blue Crab	Patapsco River Background Area	10/5/2010	149	143	PR-CASA-MT-C, MU-C
PR-CASA-018	Blue Crab	Patapsco River Background Area	10/5/2010	162	145	PR-CASA-MT-C, MU-C
PR-CASA-019	Blue Crab	Patapsco River Background Area	10/5/2010	167	155	PR-CASA-MT-D, MU-D
PR-CASA-020	Blue Crab	Patapsco River Background Area	10/5/2010	154	118	PR-CASA-MT-D, MU-D
PR-CASA-021	Blue Crab	Patapsco River Background Area	10/5/2010	149	105	PR-CASA-MT-D, MU-D
PR-CASA-022	Blue Crab	Patapsco River Background Area	10/5/2010	147	106	PR-CASA-MT-D, MU-D
PR-CASA-023	Blue Crab	Patapsco River Background Area	10/5/2010	159	155	PR-CASA-MT-D, MU-D
PR-CASA-024	Blue Crab	Patapsco River Background Area	10/5/2010	151	134	PR-CASA-MT-D, MU-D
PR-CASA-025	Blue Crab	Patapsco River Background Area	10/5/2010	155	122	PR-CASA-MT-E, MU-E
PR-CASA-026	Blue Crab	Patapsco River Background Area	10/5/2010	135	123	PR-CASA-MT-E, MU-E
PR-CASA-027	Blue Crab	Patapsco River Background Area	10/5/2010	152	124	PR-CASA-MT-E, MU-E
PR-CASA-028	Blue Crab	Patapsco River Background Area	10/5/2010	145	119	PR-CASA-MT-E, MU-E
PR-CASA-029	Blue Crab	Patapsco River Background Area	10/5/2010	149	124	PR-CASA-MT-E, MU-E
PR-CASA-030	Blue Crab	Patapsco River Background Area	10/5/2010	150	123	PR-CASA-MT-E, MU-E
CP-CASA-001	Blue Crab	Coke Point Offshore Area	9/29/2010	155	122	CP-CASA-MT-A, MU-A
CP-CASA-002	Blue Crab	Coke Point Offshore Area	9/29/2010	169	133	CP-CASA-MT-A, MU-A
CP-CASA-003	Blue Crab	Coke Point Offshore Area	9/29/2010	163	125	CP-CASA-MT-A, MU-A
CP-CASA-004	Blue Crab	Coke Point Offshore Area	9/29/2010	170	133	CP-CASA-MT-A, MU-A
CP-CASA-005	Blue Crab	Coke Point Offshore Area	9/29/2010	159	157	CP-CASA-MT-A, MU-A
CP-CASA-006	Blue Crab	Coke Point Offshore Area	9/29/2010	170	156	CP-CASA-MT-A, MU-A
CP-CASA-007	Blue Crab	Coke Point Offshore Area	9/29/2010	153	100	CP-CASA-MT-B, MU-B
CP-CASA-008	Blue Crab	Coke Point Offshore Area	9/29/2010	155	106	CP-CASA-MT-B, MU-B
CP-CASA-009	Blue Crab	Coke Point Offshore Area	9/29/2010	155	105	CP-CASA-MT-B, MU-B
CP-CASA-010	Blue Crab	Coke Point Offshore Area	9/29/2010	154	97	CP-CASA-MT-B, MU-B
CP-CASA-011	Blue Crab	Coke Point Offshore Area	9/29/2010	154	126	CP-CASA-MT-B, MU-B
CP-CASA-012	Blue Crab	Coke Point Offshore Area	9/29/2010	154	113	CP-CASA-MT-B, MU-B
CP-CASA-013	Blue Crab	Coke Point Offshore Area	9/29/2010	167	181	CP-CASA-MU-B
CP-CASA-014	Blue Crab	Coke Point Offshore Area	9/29/2010	154	119	CP-CASA-MU-A
CP-CASA-015	Blue Crab	Coke Point Offshore Area	9/29/2010	153	104	--
CP-CASA-016	Blue Crab	Coke Point Offshore Area	9/29/2010	142	112	CP-CASA-MU-A
CP-CASA-017	Blue Crab	Coke Point Offshore Area	9/29/2010	148	99	--
CP-CASA-018	Blue Crab	Coke Point Offshore Area	9/29/2010	158	175	CP-CASA-MU-A
CP-CASA-019	Blue Crab	Coke Point Offshore Area	9/29/2010	146	113	CP-CASA-MU-A
CP-CASA-020	Blue Crab	Coke Point Offshore Area	9/29/2010	134	87	CP-CASA-MU-B
CP-CASA-021	Blue Crab	Coke Point Offshore Area	9/29/2010	141	104	CP-CASA-MU-B
CP-CASA-022	Blue Crab	Coke Point Offshore Area	9/29/2010	143	66	CP-CASA-MU-B
CP-CASA-023	Blue Crab	Coke Point Offshore Area	9/29/2010	140	83	CP-CASA-MU-B
CP-CASA-024	Blue Crab	Coke Point Offshore Area	9/29/2010	140	92	CP-CASA-MU-B
CP-CASA-025	Blue Crab	Coke Point Offshore Area	9/29/2010	161	119	CP-CASA-MU-B
CP-CASA-026	Blue Crab	Coke Point Offshore Area	9/29/2010	154	95	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-027	Blue Crab	Coke Point Offshore Area	9/29/2010	148	141	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-028	Blue Crab	Coke Point Offshore Area	9/29/2010	148	126	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-029	Blue Crab	Coke Point Offshore Area	9/29/2010	152	109	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-030	Blue Crab	Coke Point Offshore Area	9/29/2010	154	96	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-031	Blue Crab	Coke Point Offshore Area	9/29/2010	144	82	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-032	Blue Crab	Coke Point Offshore Area	9/29/2010	165	162	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-033	Blue Crab	Coke Point Offshore Area	9/29/2010	150	105	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-034	Blue Crab	Coke Point Offshore Area	9/29/2010	167	181	CP-CASA-MT-C, MU-C
CP-CASA-035	Blue Crab	Coke Point Offshore Area	9/29/2010	154	119	CP-CASA-MT-C, MU-C
CP-CASA-036	Blue Crab	Coke Point Offshore Area	9/29/2010	153	104	CP-CASA-MT-C, MU-C

Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
CP-CASA-037	Blue Crab	Coke Point Offshore Area	9/29/2010	142	112	CP-CASA-MT-C, MU-C
CP-CASA-038	Blue Crab	Coke Point Offshore Area	9/29/2010	148	99	CP-CASA-MT-C, MU-C
CP-CASA-039	Blue Crab	Coke Point Offshore Area	9/29/2010	158	175	CP-CASA-MT-C, MU-C
CP-CASA-040	Blue Crab	Coke Point Offshore Area	9/29/2010	148	129	CP-CASA-MU-C
CP-CASA-041	Blue Crab	Coke Point Offshore Area	9/29/2010	108	150	CP-CASA-MU-C
CP-CASA-042	Blue Crab	Coke Point Offshore Area	9/29/2010	152	137	CP-CASA-MU-C
CP-CASA-043	Blue Crab	Coke Point Offshore Area	9/29/2010	148	124	CP-CASA-MU-C
CP-CASA-044	Blue Crab	Coke Point Offshore Area	9/29/2010	153	112	CP-CASA-MU-C
CP-CASA-045	Blue Crab	Coke Point Offshore Area	9/29/2010	155	92	CP-CASA-MU-C
CP-CASA-046	Blue Crab	Coke Point Offshore Area	9/29/2010	153	132	CP-CASA-MU-C
CP-CASA-047	Blue Crab	Coke Point Offshore Area	9/29/2010	147	84	CP-CASA-MU-C
CP-CASA-048	Blue Crab	Coke Point Offshore Area	9/29/2010	137	83	CP-CASA-MU-C
CP-CASA-049	Blue Crab	Coke Point Offshore Area	9/29/2010	146	91	CP-CASA-MU-C
CP-CASA-050	Blue Crab	Coke Point Offshore Area	9/29/2010	148	95	CP-CASA-MU-C
CP-CASA-051	Blue Crab	Coke Point Offshore Area	9/29/2010	133	80	CP-CASA-MU-C
CP-CASA-052	Blue Crab	Coke Point Offshore Area	9/29/2010	142	79	CP-CASA-MU-C
CP-CASA-053	Blue Crab	Coke Point Offshore Area	9/29/2010	158	57	CP-CASA-MU-C
CP-CASA-054	Blue Crab	Coke Point Offshore Area	9/29/2010	143	60	CP-CASA-MU-C
CP-CASA-055	Blue Crab	Coke Point Offshore Area	9/29/2010	153	118	CP-CASA-MU-C
CP-CASA-056	Blue Crab	Coke Point Offshore Area	9/29/2010	150	89	CP-CASA-MU-C
CP-CASA-057	Blue Crab	Coke Point Offshore Area	9/29/2010	137	93	CP-CASA-MU-C
CP-CASA-058	Blue Crab	Coke Point Offshore Area	9/29/2010	144	75	CP-CASA-MU-C
CP-CASA-059	Blue Crab	Coke Point Offshore Area	9/29/2010	153	84	CP-CASA-MU-C
CP-CASA-060	Blue Crab	Coke Point Offshore Area	9/29/2010	140	90	CP-CASA-MU-C
CP-CASA-061	Blue Crab	Coke Point Offshore Area	9/29/2010	145	86	CP-CASA-MU-C
CP-CASA-062	Blue Crab	Coke Point Offshore Area	9/29/2010	146	113	CP-CASA-MT-D, MU-D
CP-CASA-063	Blue Crab	Coke Point Offshore Area	9/29/2010	134	87	CP-CASA-MT-D, MU-D
CP-CASA-064	Blue Crab	Coke Point Offshore Area	9/29/2010	141	104	CP-CASA-MT-D, MU-D
CP-CASA-065	Blue Crab	Coke Point Offshore Area	9/29/2010	143	66	CP-CASA-MT-D, MU-D
CP-CASA-066	Blue Crab	Coke Point Offshore Area	9/29/2010	140	83	CP-CASA-MT-D, MU-D
CP-CASA-067	Blue Crab	Coke Point Offshore Area	9/29/2010	140	92	CP-CASA-MT-D, MU-D
CP-CASA-068	Blue Crab	Coke Point Offshore Area	9/29/2010	161	119	CP-CASA-MT-D, MU-D
CP-CASA-069	Blue Crab	Coke Point Offshore Area	9/29/2010	155	93	CP-CASA-MT-D, MU-D
CP-CASA-070	Blue Crab	Coke Point Offshore Area	9/29/2010	145	95	CP-CASA-MU-D
CP-CASA-071	Blue Crab	Coke Point Offshore Area	9/29/2010	146	70	CP-CASA-MU-D
CP-CASA-072	Blue Crab	Coke Point Offshore Area	9/29/2010	138	77	CP-CASA-MU-D
CP-CASA-073	Blue Crab	Coke Point Offshore Area	9/29/2010	148	94	CP-CASA-MU-C
CP-CASA-074	Blue Crab	Coke Point Offshore Area	9/29/2010	148	94	CP-CASA-MU-C
CP-CASA-075	Blue Crab	Coke Point Offshore Area	9/29/2010	141	82	CP-CASA-MU-C
CP-CASA-076	Blue Crab	Coke Point Offshore Area	9/29/2010	153	70	CP-CASA-MU-C

*Original sample lost at the laboratotry, resampled on October 18, 2010.

Attachment B
Table 2. Tissue Composites Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
EA Samples								
CP-MOAM-WB-A	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-WB-B	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-WB-C	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-WB-D	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-WB-E	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-A	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-FT-B	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-FT-C	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-D	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-E	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-A	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-B	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-C	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-D	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-E	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-EMS	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MT-EMSD	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-A	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-B	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-C	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-D	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-E	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-EMS	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-EMSD	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
PR-MOAM-WB-A	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-WB-B	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-WB-C	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-D	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-E	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-EMS	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	
PR-MOAM-WB-EMSD	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	
PR-MOAM-FT-A	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-FT-B	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-FT-C	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-D	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-E	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-EMS	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	
PR-MOAM-FT-EMSD	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	
PR-CASA-MT-A	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x

Attachment B
Table 2. Tissue Composites Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
PR-CASA-MT-B	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MT-C	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-D	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-E	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-A	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-B	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-C	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-D	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-E	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
INTRA-LAB BLANK	Rinse blank	Rinsate	Quality Control	x	x	x		
Field Total				48	48	48	24	40
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-3	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-4	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Fish Composite	Whole body	Laboratory Control	x	x	x	x	
LABDUP2	Fish Composite	Fillet (by lab)	Laboratory Control	x	x	x	x	
LABDUP3	Crab Composite	Meat	Laboratory Control	x	x	x	x	
LABDUP4	Crab Composite	Mustard	Laboratory Control	x	x	x	x	
Field Total				8	4	4	4	0
Total				**56**	**52**	**52**	**28**	**40**

Attachment B
Table 3. Sediment Samples Collected During Field Studies

Sample	Media	Type	Area	Metals (SW846 6020, SW846 7471A)	SVOCs & PAHs (SW846 8270)	PCB Congeners (SW846 8082)	Grain size (ASTM D422)	TOC (Lloyd Kahn)	Hexavalent Chromium
EA Samples									
BH-SED-03C-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-03-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
BH-SED-10-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-02-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
S-B1-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
CP-SED-COMP	Sediment	Composite	Coke Point Offshore Area	x	x	x	x		x
CP-SED-COMP-MS	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
CP-SED-COMP-MSD	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
EH2-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH3-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH4-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
PR-SED-COMP	Sediment	Composite	Patapsco River Background Area	x	x	x	x		x
LAB-SED-COMP	Sediment	Control	Control Sample (lab control & pre-test)	x	x	x	x		
Rinse Blank	Rinsate	Rinse blank	Quality Control	x	x	x			
Lab Total				13	13	13	11	0	4
Lab Samples									
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
Field Total				2	2	2	0	0	0
Total				**15**	**15**	**15**	**11**	**0**	**4**

Attachment B
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
EA Samples								
CP-CLAM-01	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-01MS	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-01MSD	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-02	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-03	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-04	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-05	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-01	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-01MS	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-01MSD	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-02	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-03	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-04	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-05	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
PR-CLAM-01	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-02	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-03	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-04	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-05	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-01	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-02	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-03	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-04	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-05	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PRETEST-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
PRETEST-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x

Attachment B
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
PRETEST-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
Lab Total				36	36	36	16	32
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Clam	Control	Laboratory Control					x
LABDUP2	Worm	Control	Laboratory Control					x
Field Total				2	0	0	0	2
Total				**38**	**36**	**36**	**16**	**34**

ATTACHMENT C:

FIELD DATA SHEETS FROM FALL 2010 SEDIMENT AND TISSUE SAMPLING EVENT

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Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/21/10 0900-1200

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] CP – Coke Point Offshore Area [ ] PR – Patapsco River Background Area

Specific Collection Location Description: GPS points to be taken

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other hook+line

Collector(s) Name(s): (Print and sign) Rob Ballentine, Antti Koskela, Dave Fry (CEA)

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
White perch (Morone americana)	194	100	Y	CP-MOAM-001
MOAM	200	108	Y	CP-MOAM-002
MOAM	186	94		-003
MOAM	212	145		-004
MOAM	217	154		-005
MOAM	207	129		-006
MOAM	225	179		-007
MOAM	223	161		-008
MOAM	213	154		-009
MOAM	191	98		-010
MOAM	200	115		-011
MOAM	192	100		-012
MOAM	176	80		-013
MOAM	174	76		-014
MOAM	182	90		-015
MOAM	210	148		-016
MOAM	220	150		-017
MOAM	217	144		-018
MOAM	216	163		-019
MOAM	235	184		-020
MOAM	238	209		-021
MOAM	197	104	Y	-022

Pg. 2 of 2

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/21/10 0900-1200

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Specific Collection Location Description: GPS Points to be taken

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other Hook + line

Collector(s) Name(s): (Print and sign) Rob Ballentine, Antti Koshelo, Dave Ivy (CEM)

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
White Perch (MOAM)	196	115	Y	CP-MOAM-023
MOAM	195	119	Y	CP-MOAM-024
MOAM	190	87	↓	-025
MOAM	192	97	↓	-026
MOAM	197	108	↓	-027
MOAM	206	126	↓	-028
MOAM	205	128	↓	-029
MOAM	206	123	↓	-030
MOAM	192	109	↓	CPMOAM-031
MOAM	198	122	↓	032
MOAM	211	138	↓	033

Pg. 1 of 1

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/23/10 1310

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: GPS Points in Field Book PR-Fish1

Collection Method: [ ] Otter Trawl [ ] Jug Line [ ] Crab Trap [ ] Crab Pot [ ] Hand Collected [X] Other Hook & Line

Collector(s) Name(s): (Print and sign) R. Ballantine, K. Rigney, D. Ivy

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
(PR-MOAM-001) MOAM	190	120	Y	PR-MOAM-001
MOAM	211	132		PR-MOAM-002
MOAM	170	69		-003
MOAM	175	81		-004
MOAM	255	257		-005
MOAM	213	155		-006
MOAM	209	113		-007
MOAM	171	67		-008
MOAM	175	78		-009
MOAM	193	111		-010
MOAM	254	256		-011
(PR-MOAM-012) MOAM	175	77		-012

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/24/10 1350

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: GPS Point B in Fish book PR-Fish 2

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other hook & line

Collector(s) Name(s): (Print and sign) R. Ballentine, M. Rigney, D. Ivy

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
(PR-MOAM-013) MOAM	217	180	Y	PR-MOAM-013
MOAM	175	101		PR-MOAM-014
MOAM	174	86		-015
MOAM	178	95		-016
(~~RR~~ PR-MOAM-017) MOAM	174	87		-017

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/29/10 1240

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: GPS points in Field book PR-Fish3

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [ ] Other_____

Collector(s) Name(s): (Print and sign) R. Ballantine, K. Rigney, D. Ivy

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
MOAM - WhitePerch	227	176	Y	PR-MOAM-018
MOAM	243	227		-019
MOAM	210	146		-020
MOAM	212	148		-021
MOAM	224	187		-022
MOAM	215	147		-023
MOAM	247	231		-024
MOAM	254	253		-025
MOAM	217	172		-026
MOAM	219	142		-027
MOAM	222	183		-028
MOAM	204	137		-029
MOAM	200	121		-030
* MOAM	198			-031
* MOAM	182			-032
* MOAM	195			-032

Pg. 1 of 2

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 10-5-10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: SOLLERS POINT

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other TROT LINES

Collector(s) Name(s): R. Ballentine, Kristen Rigney
(Print and sign)

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

	Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes	
MT-A MU-A	CALLINECTES SAPIDUS	149	162	Y	PR-CASA-001	MALES ♂
		153	185	Y	PR-CASA-002	
		135	130	Y	PR-CASA-003	
		130	127	Y	PR-CASA-004	
		134	130	Y	PR-CASA-005	
		124	126	Y	PR-CASA-006	
MT-B MU-B		140	119	Y	PR-CASA-007	♂
		153	231	Y	PR-CASA-008	
		154	232	Y	PR-CASA-009	
		153	180	Y	PR-CASA-010	
		171	221	Y	PR-CASA-011	
		~~148~~ 143	~~138~~ 136	Y	PR-CASA-012	
MT-C MU-C		164	187	Y	PR-CASA-013	FEMALES ♀
		155	152	Y	PR-CASA-014	
		153	149	Y	PR-CASA-015	
		161	165	Y	PR-CASA-016	
		149	143	Y	PR-CASA-017	
		162	145	Y	PR-CASA-018	

Pg. 2 of 2

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 10-5-10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: SOLLERS POINT

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other TROT LINES

Collector(s) Name(s): (Print and sign) R. Ballentine, Kristin Rigney

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

	Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes	Gender
MT-D MU-D	CALLINECTES SAPIDUS	167	155	Y	PR-CASA-~~001~~ 019	♀ FEMALE
		154	118	Y	PR-CASA- 020	
		149	105	Y	PR-CASA- 021	
		147	100	Y	PR-CASA 022	
		159	155	Y	PR-CASA- 023	
		151	134	Y	PR-CASA- 024	
MT-E MU-E		155	122	Y	PR-CASA- 025	♀ FEMALE
		135	123	Y	PR-CASA- 026	
		152	124	Y	PR-CASA- 027	
		145	119	Y	PR-CASA- 028	
		149	124	Y	PR-CASA- 029	
		150	123	Y	PR-CASA- 030	

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/29/10 1410

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] CP – Coke Point Offshore Area [ ] PR – Patapsco River Background Area

Specific Collection Location Description: COLLECTED AT COKEPOINT

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other TROT LINES

Collector(s) Name(s): (Print and sign) ROB BALLANTINE & KRISTEN RIGNEY

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes	Sex	
CALLINECTES SAPIDUS	155	122	Y	CP-CASA-001	♀	
	169	133	Y	CP-CASA-002	♀	
	163	125		CP-CASA-003	♀	
	170	133		CP-CASA-004	♀	
	159	157		CP-CASA-005	♀	
	170	156		CP-CASA-006	♀	MT A
	153	100		CP-CASA-007	♀	
	155	106		CP-CASA-008	♀	
	155	105		CP-CASA-009		MT B
	154	97		CP-CASA-010		
	154	126		CP-CASA-011		
	154	113		CP-CASA-012	♂	
	175	135		CP-CASA-013	♀	
	152	72		CP-CASA-014		
	163	99		CP-CASA-015		
	169	135		CP-CASA-016		
	162	78		CP-CASA-017		
	142	78		CP-CASA-018		
	151	94		CP-CASA-019		
	151	114		CP-CASA-020	♂	
	148	96		CP-CASA-021	♀	
	160	93		CP-CASA-022	♀	

Weight affected by lack of claws for some

Pg. 2 of 4

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** ~~10~~ 9/29/10 1410

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] CP – Coke Point Offshore Area [ ] PR – Patapsco River Background Area

Specific Collection Location Description: COKE POINT

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other TROT LINE

Collector(s) Name(s): (Print and sign) ROB BALLANTINE, KRISTEN RIGNEY

FINFISH/SHELLFISH COLLECTED

For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
CASA	163	102		CP-CASA-023 ♀
CASA	143	92		CP-CASA-024 ♀
CASA	157	116		CP-CASA-025 ♀
	154	95		CP-CASA-026 ♂
	148	141		CP-CASA-027 ♂
	148	126		CP-CASA-028 ♂
	152	109		CP-CASA-029 ♂ MT-E
	154	96		CP-CASA-030 ♂ MS/MS
	144	82		CP-CASA-031 ♂
	165	162		CP-CASA-032 ♂
	150	105		CP-CASA-033 ♂
	167	181		CP-CASA-034 ♂
	154	119		CP-CASA-035 MT-C
	153	104		CP-CASA-036
	142	112		CP-CASA-037
	148	99		CP-CASA-038
	158	175		CP-CASA-039
	148	129		CP-CASA-040 ♂
	108	150		CP-CASA-041
	152	137		CP-CASA-042
	148	124		CP-CASA-043
	153	112		CP-CASA-044

B. 3 of 4

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/29/10 1410

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] CP – Coke Point Offshore Area [ ] PR – Patapsco River Background Area

Specific Collection Location Description: COKE PT.

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other TROT LINE

Collector(s) Name(s): (Print and sign) R. BALLANTINE, ~~D. IVY~~, M. CIARCO K RIGNEY

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish.
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
CP-CASA-045	155	92		CP-CASA-045 ♂
CASA	153	132		CP-CASA-046 ♂
CASA	147	84		CP-CASA-047 ♂
	137	83		CP-CASA-048
	146	91		-049
	148	95		-050
	133	80		-051
	142	79		-052
	158	57		-053
	143	60		-054
	153	118		-055
	150	89		-056
	137	93		-057
	144	75		-058
	153	84		-059
	140	90		-060 ♂
	145	86		-061 ♂
	146	113		-062 ♀
	134	87		-063 ♀
	141	104		-064
	143	66		-065
	140	83		-066

MT-D

Field Sheet for Fish Collection

Project Number: 1453417 **Sampling Date and Time:** 9/29/10 1410

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Specific Collection Location Description: COKEPT

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected
[ ] Jug Line [ ] Crab Pot [X] Other TROT LINE

Collector(s) Name(s):
(Print and sign)

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
CASA	140	92		CP-CASA 067 ♀ MT-D Cont.
	161	119		CP-CASA-068 ♀
	155	93		CP-CASA-069 ♀
	145	95		CP-CASA-070 ♀
	146	70		CP-CASA-071 ♀
	138	77		CP-CASA-072 ♀
	148	94		073 ♀
	148	94		074 ♀
	~~17~~ (141)	82		075 ♀
	153	70		076

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 1430

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): HILARY LOCKWOOD & MIKE CIARLO
(Print and sign)

COMPOSITE NAME: CP-MOAM-WB-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-013	176	80
CP-MOAM-014	174	76
CP-MOAM-015	182	90

IS SAMPLE USED FOR DUP/MS/MSD? N **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation 1440 21.C

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 ~~1440~~

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: M. americana

Preparer(s) Name(s): H. Lochwood & M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-WB-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CPMOAM-003	186	94
CP-MOAM-025	190	87
CP-MOAM-010	191	98

IS SAMPLE USED FOR DUP/MS/MSD? N **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 14:42

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: M. americana

Preparer(s) Name(s): H. Lockwood & M. Carlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-WB-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-012	192	100
CP-MOAM-026	192	97
CP-MOAM-001	194	100

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 1444

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Moroneamericana

Preparer(s) Name(s): H. Lockwood & M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-WB-D

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-022	197	104
CP-MOAM-023	196	115
CP-MOAM 024	195	119

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 1446

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): H. Lockwood & M. Ciar Co
(Print and sign)

COMPOSITE NAME: CP-MOAM-WB-E
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-002	200	108
CP-MOAM-027	197	108
CP-MOAM-011	200	115

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

10.18.2010 1530

Field Sheet for Fish Composite Preparation ~~10.18.2010 1530~~

Project Number: 1453417 **Composite Prep Date and Time:** ~~1447 10.1.10~~ See note

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [✓] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): H. Lockwood & M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-FT-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
~~CP-MOAM-029~~	~~205~~	~~128~~
~~CP-MOAM-028~~	~~206~~	~~126~~
~~CP-MOAM-030~~	~~206~~	~~123~~
CP-MOAM-031	192	109
CP-MOAM-032	198	122
CP-MOAM-033	211	138

NOTE - ORIGINAL SAMPLE LOST AT LAB RESAMPLED AT ABOVE DATE

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 1448 10.1.10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): A. Lockwood & M. Ciario
(Print and sign)

COMPOSITE NAME: CP-MOAM-FT-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-006	207	129
CP-MOAM-016	210	148
CP-MOAM-004	212	145

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 1450 10.1.10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [√] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): H. Lockwood + M. Ciorlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-FT-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM -009	213	154
CP-MOAM-019	216	163
CP-MOAM-005	217	154

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1452

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [√] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): H. Lockwood + M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-FT-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-018	217	144
CP-MOAM-017	220	150
CP-MOAM-008	223	161

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 1454 10-1-10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [✓] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: Morone americana

Preparer(s) Name(s): H. Lockwood & M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-MOAM-FT-E
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-MOAM-007	225	179
CP-MOAM-020	235	184
CP-MOAM-021	238	209

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1510

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: ~~CP~~ **CP – Coke Point Offshore Area** [X] m.c. **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARLO
(Print and sign)

COMPOSITE NAME: ~~CP~~ PR-MOAM-WB-A

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
~~PR-MOAM-WB-A~~		
PR-MOAM-003	170	69
PR-MOAM-008	171	67
PR-MOAM-015	174	86

mc

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 1511 10-1-10

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: ~~X~~ **CP – Coke Point Offshore Area** X M.C **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD, M. CIARLO
(Print and sign)

COMPOSITE NAME: ~~CP~~ PR-MOAM-WB-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-017	174	87
PR-MOAM-004	175	81
PR-MOAM-009	175	78

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 1513

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARLO
(Print and sign)

COMPOSITE NAME: PR-MOAM-WB-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-012	175	77
PR-MOAM-014	175	101
PR-MOAM-016	178	95

IS SAMPLE USED FOR DUP/MS/MSD? No **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-1-10 1515

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: ~~PR-MOAM~~ MORONE AMERICANA

Preparer(s) Name(s): H. Lockwood & M. Cook
(Print and sign)

COMPOSITE NAME: PR-MOAM-WB-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-001	190	120
PR-MOAM-010	193	~~98~~ 111 mc.
PR-MOAM-030	200	~~121~~ 121 mc.

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1516

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARCO
(Print and sign)

COMPOSITE NAME: PR-MOAM-WB-E
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-018	227	176
PR-MOAM-019	243	227
PR-MOAM-024	247	231

IS SAMPLE USED FOR DUP/MS/MSD? YES **IF YES, INCLUDE EXTRA MASS.**

TOTAL MASS : 717

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10·1·10 1518

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARLO
(Print and sign)

COMPOSITE NAME: PR-MOAM-FT-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
~~PR-MOAM-FT-A~~		
PR-MOAM-029	204	137
PR-MOAM-007	209	113
PR-MOAM-020	210	146

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1524

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARIO
(Print and sign)

COMPOSITE NAME: ~~PR-MOAM-WB~~ PR-MOAM-FT-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-002	211	132
PR-MOAM-021	212	148
PR-MOAM-006	213	155

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10·1·10 1522

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARLO
(Print and sign)

COMPOSITE NAME: PR - MOAM - FT - C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR - MOAM - 023	215	147
PR - MOAM - 013	217	180
PR - MOAM - 026	217	172

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1526

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARLO
(Print and sign)

COMPOSITE NAME: PR-MOAM-FT-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-027	219	142
PR-MOAM-028	222	183
PR-MOAM-022	224	187

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1527

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CARLO
(Print and sign)

COMPOSITE NAME: ~~PR~~ PR-MOAM-FT-E
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-011	254	256
PR-MOAM-025	254	253
PR-MOAM-005	255	257

IS SAMPLE USED FOR DUP/MS/MSD? YES **IF YES, INCLUDE EXTRA MASS.**

* see separate data sheet for MS/MSD

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.1.10 1550

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: MORONE AMERICANA

Preparer(s) Name(s): H. LOCKWOOD & M. CIARCO
(Print and sign)

COMPOSITE NAME: PR-MOAM-FT-E MS/MSD
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-MOAM-031	198	
PR-MOAM-032	182	
PR-MOAM-033	195	

IS SAMPLE USED FOR DUP/MS/MSD? ✓ **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10 1100

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): DAVE IVY & ROB BALLANTINE & MIKE CIARLO
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-001	155	122
-002	169	133
-003	163	125
-004	170	133
-005	159	157
-006	170	156
~~-013~~	~~175~~	~~135~~

♀

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

~297g jarred

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-4-10 1200

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): David Ivy, Rob Ballantine, M. Ciaco
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-007		
-008		
-009		
-010		
-011		
-012		

♀

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-4-10 1340

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): R Ballentine, D. Ivy, M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP- CASA-034		
CP- CASA-035		
CP- CASA-036		
CP- CASA-037		
CP- CASA-038		
CP- CASA-039		
CP-		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

80g

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-4-10 1500

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): R.B., DI, MC.
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-062		
CP-CASA-063		
CP-CASA-064		
CP-CASA-065		
CP-CASA-066		
CP-CASA-067		
CP-CASA-068		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

CP-CASA-069

Sample 730g

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-4-10 1300

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): P. Ivy, R. Ballantyne, M. Cook
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-E & EMS/MSD

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-026		
CP-CASA-027		
CP-CASA-028		
CP-CASA-029		
CP-CASA-030		
CP-CASA-031		
CP-CASA-032		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

CP-CASA-033

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10 1100

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): BALLANTINE, IVY, RIARLO
(Print and sign)

COMPOSITE NAME: CP-CASA-MU-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-001		
CP-CASA-002		
CP-CASA-003		
CP-CASA-004		
CP-CASA-005		
CP-CASA-006		
CP-CASA-013		

♀

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

CP-CASA-014
CP-CASA-016
CP-CASA-018
CP-CASA-019

Added crabs to achieve mass of mustard

51g jarred

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10 1200

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): D. Ivy, Rob Ballentine, M. Ciarlo
(Print and sign)

COMPOSITE NAME: CP-CASA-MU-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-007		
008		
009		
010		
012		
013		
020		

♀

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

-021
-022
-023
-024
-025

Sample weight 59g

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10 1340

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): R. Ballentine, P. Ivy, M. Ciuto
(Print and sign)

COMPOSITE NAME: CP-CASA-MT-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-034		
CP-CASA-035		
CP-CASA-036		
CP-CACA-037		
CP-CASA-038		
CP-CASA-039		
CP-CASA-040		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

041
042
043 50g
044
045
046
047
048 through ~~061~~ 076

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10. 1500

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CA SA

Preparer(s) Name(s): RB, DI, MC
(Print and sign)

COMPOSITE NAME: CP-CASA-MU-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-062		
-063		
-064		
-065		
-066		
-067		
-068		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

-069
~~-070~~
-070
-071 50g
-072

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.4.10. 1300

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [X] **CP – Coke Point Offshore Area** [ ] **PR – Patapsco River Background Area**

Species: CASA

Preparer(s) Name(s): D. Ivy, R. Ballentine, M. Ciancio
(Print and sign)

COMPOSITE NAME: CP-CASA-MU-E & EMS/MSD
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
CP-CASA-026		
CP-CASA-027		
CP-CASA-028		
CP-CASA-029		
CP-CASA-030		
CP-CASA-031		
CP-CASA-032		

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

50g + 50g

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.5.10 ~~0900~~ 0830

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): D Ivy R Ballentine
(Print and sign)

COMPOSITE NAME: PR-CASA-MOT-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-001	149	162
PR-CASA-002	153	185
PR-CASA-003	135	130
PR-CASA-004	130	127
PR-CASA-005	134	130
PR-CASA-006	124	126

SAMPLE MASS
93g of MEAT

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 0949

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. IVY, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MT-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA - 007	140	119
PR-CASA - 008	153	231
PR-CASA-009	154	232
PR-CASA-010	153	180
PR-CASA-011	171	221
PR-CASA-012	143	136

SAMPLE MASS
123g OF MEAT

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1047

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. Ivy, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MT-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

SAMPLE MASS

103g OF MEAT

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA - 013	164	187
PR-CASA - 014	155	152
PR-CASA - 015	153	149
PR-CASA - 016	161	165
PR-CASA - 017	149	143
PR-CASA - 018	162	145

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1250

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. IVY, Z. BECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MT-D

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-019	167	155
PR-CASA-020	154	118
PR-CASA-021	149	105
PR-CASA-022	147	106
PR-CASA-023	159	155
PR-CASA-024	151	134

SAMPLE MASS

79g OF MEAT

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1355

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. Ivy, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MT-E

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-025	155	122
PR-CASA-026	135	123
PR-CASA-027	152	124
PR-CASA-028	145	119
PR-CASA-029	149	124
PR-CASA-030	150	123

SAMPLE MASS

70g OF MEAT

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10.5.10 0830

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): D. Ivy, Z. Bueeker, R. BALLANTINE
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-A
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-001	149	162
PR-CASA-002	153	185
PR-CASA-003	135	130
PR-CASA-004	130	127
PR-CASA-005	134	130
PR-CASA-006	124	126

SAMPLE MASS

59g OF MUSTARD

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 0949

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. IVY, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-B
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-007	140	119
PR-CASA-008	153	231
PR-CASA-009	154	232
PR-CASA-010	153	180
PR-CASA-011	171	221
PR-CASA-012	143	136

SAMPLE MASS

62g OF MUSTARD

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1047

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. Ly, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-C
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-013	164	187
PR-CASA-014	155	152
PR-CASA-015	153	149
PR-CASA-016	161	165
PR-CASA-017	149	143
PR-CASA-018	162	145

SAMPLE MASS

75g OF MUSTARD

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1250

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): D. FUY, Z. BUECKER, R. BALLANTINE
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

SAMPLE MASS

63g OF MUSTARD

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-019	167	155
PR-CASA-020	154	118
PR-CASA-021	149	105
PR-CASA-022	147	106
PR-CASA-023	159	155
PR-CASA-024	151	134

IS SAMPLE USED FOR DUP/MS/MSD? NA **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10-5-10 1355

Site Name: Bioaccumulation Study for in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] **CP – Coke Point Offshore Area** [X] **PR – Patapsco River Background Area**

Species: CALLINECTES SAPIDUS

Preparer(s) Name(s): R. BALLANTINE, D. IVY, Z. BUECKER
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-E

For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA - 025	155	122
PR-CASA - 026	135	123
PR-CASA - 027	152	124
PR-CASA - 028	145	119
PR-CASA - 029	149	124
PR-CASA - 030	160	123

SAMPLE MASS

59g OF MUSTARD.

IS SAMPLE USED FOR DUP/MS/MSD? NO **IF YES, INCLUDE EXTRA MASS.**

Field Sheet for Fish Collection

(RB) 10/29/10 (RB) 1410

Project Number: 1453417 **Sampling Date and Time:** ~~10/27/10~~ ~~1230~~

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Specific Collection Location Description: Sollers Point

Collection Method: [ ] Otter Trawl [ ] Crab Trap [ ] Hand Collected [ ] Jug Line [ ] Crab Pot [X] Other trot line

Collector(s) Name(s): R. Ballentine, K. Rigney
(Print and sign)

FINFISH/SHELLFISH COLLECTED
For collected specimens, sample ID format is Area-Species- Number
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
For sample number use three digits.

MU-D ♀

Species Name	Length (mm)	Mass (g)	Collected? (Y or N)	Sample ID or Notes
Callinectes Sapidus	146	96	Y	PR-CASA-031
			Y	PR-CASA-032
			Y	PR-CASA-033
			Y	PR-CASA-034
			Y	PR-CASA-035
			Y	PR-CASA-036

Field Sheet for Fish Composite Preparation

Project Number: 1453417 **Composite Prep Date and Time:** 10/11/10 1230

Site Name: Bioaccumulation Studies in Support of the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point

Area: [ ] CP – Coke Point Offshore Area [X] PR – Patapsco River Background Area

Species: Callinectes sapidus

Preparer(s) Name(s): K. Rigney
(Print and sign)

COMPOSITE NAME: PR-CASA-MU-D
For composites, sample ID format is Area-Species- Tissue-Letter
CP=Coke Point , PR = Patapsco River
CASA = blue crab, MOAM = White perch, ICPU = Channel catfish, AMNE = Brown bullhead catfish
WB = Whole body, FT = Filet, MT = Crab Meat, MU = Crab Mustard
For sample letter, use A, B, C, D, or E.

Individual Sample Name	Length of individual (mm)	Mass of sample (g)
PR-CASA-031	146	96
-032	148	98
-033	144	96
-034	146	112
-035	156	116
-036	144	103

♀

IS SAMPLE USED FOR DUP/MS/MSD?_____ **IF YES, INCLUDE EXTRA MASS.**

54g

Weight of sample affected by missing limbs

ATTACHMENT D:

CHEMICAL ANALYTICAL DATA REPORTS

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APPENDIX H:

ATTACHMENT D

SEDIMENT ANALYTICAL DATA REPORTS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0I230506

Karin Olsen

EA Engineering, Science and Te
15 Loveton Circle
Sparks, MD 21152

TESTAMERICA LABORATORIES, INC.

Carrie L. Gamber
Project Manager

October 13, 2010

301 Alpha Drive Pittsburgh, PA 15238 **tel** 412.963.7058 **fax** 412.963.2468 **www.testamericainc.com**

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW --	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0I230506

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on September 23, 2010. The cooler was received within the proper temperature range.

Note: The initial weight extracted for the sediment samples was adjusted to account for the percent moisture of each sample whenever possible.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Due to the concentration of target compounds detected and/or matrix, several samples were analyzed at a dilution.

Sample SP09-02-00-10A had surrogate 2-fluorobiphenyl recover low and outside of the control limits. This sample was analyzed at a dilution. The SOP allows for surrogates to recover outside of the control limits on diluted analyses. All data was reported.

Samples BH-SED-03C-00-10A RE-1 and SP09-03-00-10A RE-1 had the surrogates diluted out.

Sample SP09-03-00-10A had internal standard chrysene-d12 area count not meet criteira. This sample was re-analyzed at a dilution. The diluted analysis had all internal standard area counts meet criteria. All data was reported "as is".

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

PCB Congeners:
Due to the concentration of target compounds detected, samples BH-SED-10-00-10A and SP09-03-00-10A were analyzed at a dilution.

The matrix spike recovered outside of the control limits for PCB 180.

The relative percent difference between the matrix spike and the matrix spike duplicate was outside of the control limits for several compounds.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0I230506

PCB Congeners cont.:
Several continuing calibration standards had compounds that did not meet the 15%D criteria. The samples associated with these continuing calibration standards did not have these compounds detected above the reporting limits. All data was reported.

Metals:
The serial dilution of sample EH4-00-10 was outside of the percent difference control limits for antimony. The result was flagged with an "E" qualifier.

Samples BH-SED-10-00-10A and SP09-03-00-10A were over the instruments linear range for iron and required a dilution.

The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

For the matrix spike and matrix spike duplicate, aluminum, iron, lead, and manganese recoveries were not calculated due to the concentration of analyte in the sample being >4 times the concentration of spike added.

The matrix spike and matrix spike duplicate recovered outside of the control limits for arsenic.

General Chemistry:
Several samples were analyzed at a dilution for TOC.

TestAmerica's Burlington laboratory performed the grain size analysis. All data is included in the package.

METHODS SUMMARY

C0I230506

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
PCB Congeners by SW-846 8082	SW846 8082 Cong	SW846 3541 SOXH
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	
Total Residue as Percent Solids	SM20 2540G	
TOC Lloyd Kahn Lloyd Kahn	EPA Lloyd Kahn	EPA Lloyd Kahn

References:

EPA "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY PROCEDURES MANUAL" US EPA EPA 520/5-84-006 AUGUST 1984

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0I230506

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L7DX8	001	EH4-00-10	09/22/10	10:00
L7D0D	002	EH2-00-10	09/22/10	11:10
L7D0E	003	EH3-00-10	09/22/10	10:45
L7D0F	004	BH-SED-03C-00-10A	09/22/10	11:40
L7D0G	005	S-B1-00-10A	09/22/10	12:45
L7D0H	006	BH-SED-10-00-10A	09/22/10	13:30
L7D0K	007	SP09-03-00-10A	09/22/10	14:05
L7D0N	008	SP09-02-00-10A	09/22/10	15:00

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Client:
EA Engineering Science, and Technology, Inc.

15 Loveton Circle
Sparks, MD 21152

Project Manager:
Mike Ciarlo

Phone: 410-771-4950

Field Contact:
Rob Ballentine
Phone: 410-627-2731

Project Name: Coke Point Sediment Sampling

Project#: 1453417.0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
Test America
30 Community Drive, Suite 11
Burlington, VT 05403

phone: (802) 660-1990
fax:

ATTN:

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Grain Size (Sieve and Hydrometer)	Remarks
9/22/10	1000		X	EH4-00-10	1	X	SEE PROJECT SPECIFIC ANALYTE LIST
	~~1045~~ 1110		X	EH2-00-10	1	X	
	1045		X	EH3-00-10	1	X	
	1140		X	BH-SED-03C-00-10A	1	X	
	1245		X	S-B1-00-10A	1	X	
	1330		X	BH-SED-10-00-10A	1	X	
	~~1405~~		X	~~SP09-03-00-10A~~	1	X	
	1405		X	SP09-03-00-10A	1	X	
	1500		X	SP09-02-00-10A	1	X	
			X		1	X	

Sampled by: (Signature) R. Ballentine	Date/Time 9/22/10 1200	Relinquished by: (Signature) R. Ballentine	Date/Time 9/22/10 1700
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time 9/22/10 1000

Coke Point Sediment Samples

C0I230506

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Sediment Sampling

Project#: 1453417 0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN:

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Semivolatiles and PAHs SW846 8270C	Metals (ITM) ICP/MS 6020	Mercury 7471A	PCB Congeners 8082	Total Organic Carbon by Combustion (Lloyd Kahn)		Hex Chromium (TA SOP) *Composite Samples Only*													Remarks
9/22/10	1000		X	EH4-00-10	1	X	X	X	X	X															SEE PROJECT SPECIFIC
	~~1045~~ 1110			EH2-00-10																					ANALYTE LIST
	1045			EH3-00-10																					
	1140			BH-SED-03C-00-10A																					
	1245			S-B1-00-10A																					
	1330			BH-SED-10-00-10A																					
	~~1405~~			~~SP09-02-00-10A~~																					
	1405			SP09-03-00-10A																					
	1500			SP09-02-00-10A																					

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	9/22/10 1200	[signature]	9/22/10 17:00
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time
		[signature]	9/23/10 1000

Coke Point Sediment Samples

8

(1 - 168)

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0I230506

Client: Maryland Environmental Service, Millersville, MD Date: October 27, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	EH4-00-10	C0I230506-001	Soil
1MS	EH4-00-10MS	C0I230506-001MS	Soil
1MSD	EH4-00-10MSD	C0I230506-001MSD	Soil
2	EH2-00-10	C0I230506-002	Soil
3	EH3-00-10	C0I230506-003	Soil
4	BH-SED-03C-00-10A	C0I230506-004	Soil
5	S-B1-00-10A	C0I230506-005	Soil
6	BH-SED-10-00-10A	C0I230506-006	Soil
7	SP09-03-00-10A	C0I230506-007	Soil
8	SP09-02-00-10A	C0I230506-008	Soil

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
Aluminum	0.75	3.75	None	All > 5X
Chromium	0.026	0.13	None	

Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
Iron	2.1	10.5	None	All > 5X
Thallium	0.0020	0.01	None	

Field and Equipment Blank - Field QC samples were not included in this data package.

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
1	Arsenic	8.6%/32%/OK	L/R	All samples

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - The ICP serial dilution sample exhibited acceptable %D values except the following.

ICP Sample ID	Compound	%D	Qualifier	Affected Samples
1	Antimony	49.6%	J	All samples

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-001 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 27

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	ND	0.023	mg/kg	SW846 7471A	09/27/10	L7DX81A3
		Dilution Factor: 0.5		Analysis Time..: 09:59	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.0075	
Prep Batch #...: 0271199						
Aluminum	1200 J	2.1	mg/kg	SW846 6020	09/28/10	L7DX81AD
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.20	
Antimony	0.29 ~~B~~ J	0.14	mg/kg	SW846 6020	09/28/10	L7DX81AE
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0018	
Arsenic	4.9 L	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AF
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.012	
Beryllium	0.18	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AG
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0052	
Cadmium	0.044 ~~B~~ J	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AH
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0048	
Chromium	22.6 J	0.14	mg/kg	SW846 6020	09/28/10	L7DX81AJ
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0042	
Cobalt	1.4	0.034	mg/kg	SW846 6020	09/28/10	L7DX81AK
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0010	
Copper	3.8	0.14	mg/kg	SW846 6020	09/28/10	L7DX81AL
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.023	

(Continued on next page)

nw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-001 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	8850 J	3.4	mg/kg	SW846 6020	09/28/10	L7DX81AM
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.24	
Lead	6.9	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AN
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0026	
Manganese	371	0.034	mg/kg	SW846 6020	09/28/10	L7DX81AP
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0071	
Nickel	2.5	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AQ
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0078	
Selenium	0.24 ~~B~~ J	0.34	mg/kg	SW846 6020	09/28/10	L7DX81AR
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.035	
Silver	ND	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AT
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0027	
Thallium	0.028 ~~B,J~~ J	0.069	mg/kg	SW846 6020	09/28/10	L7DX81AU
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0014	
Tin	1.8	0.34	mg/kg	SW846 6020	09/28/10	L7DX81AV
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.041	
Zinc	23.8	0.34	mg/kg	SW846 6020	09/28/10	L7DX81AW
		Dilution Factor: 0.5		Analysis Time..: 20:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.045	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

E Matrix interference.

B Estimated result. Result is less than RL.

lw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-002 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 29

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	0.021 ~~B~~ J	0.023	mg/kg	SW846 7471A	09/27/10	L7D0D1AE
		Dilution Factor: 0.5		Analysis Time..: 10:04	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.0076	
Prep Batch #...: 0271199						
Aluminum	701 J	2.1	mg/kg	SW846 6020	09/28/10	L7D0D1AH
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.20	
Antimony	0.29 J	0.14	mg/kg	SW846 6020	09/28/10	L7D0D1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0018	
Arsenic	2.4 L	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AK
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.013	
Beryllium	0.082	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AL
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0053	
Cadmium	0.062 ~~B~~ J	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AM
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0049	
Chromium	33.6 J	0.14	mg/kg	SW846 6020	09/28/10	L7D0D1AN
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0043	
Cobalt	1.2	0.035	mg/kg	SW846 6020	09/28/10	L7D0D1AP
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0011	
Copper	4.3	0.14	mg/kg	SW846 6020	09/28/10	L7D0D1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.023	

(Continued on next page)

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-002 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	4210 J	3.5	mg/kg	SW846 6020	09/28/10	L7D0D1AR
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.25	
Lead	9.2	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AT
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0027	
Manganese	132	0.035	mg/kg	SW846 6020	09/28/10	L7D0D1AU
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0072	
Nickel	2.7	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AV
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0079	
Selenium	0.15 ~~B~~ J	0.35	mg/kg	SW846 6020	09/28/10	L7D0D1AW
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.035	
Silver	ND	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1AX
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0027	
Thallium	0.027 ~~B,J~~ J	0.070	mg/kg	SW846 6020	09/28/10	L7D0D1A0
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0014	
Tin	6.4	0.35	mg/kg	SW846 6020	09/28/10	L7D0D1A1
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.042	
Zinc	45.6	0.35	mg/kg	SW846 6020	09/28/10	L7D0D1A2
		Dilution Factor: 0.5		Analysis Time..: 20:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.045	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-003 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 23

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	0.022	0.021	mg/kg	SW846 7471A	09/27/10	L7D0E1AE
		Dilution Factor: 0.5		Analysis Time..: 10:06	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.0070	
Prep Batch #...: 0271199						
Aluminum	928 J	1.9	mg/kg	SW846 6020	09/28/10	L7D0E1AH
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.18	
Antimony	0.17 J	0.13	mg/kg	SW846 6020	09/28/10	L7D0E1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0017	
Arsenic	1.8 L	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AK
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.012	
Beryllium	0.089	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AL
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0048	
Cadmium	0.10	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AM
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0045	
Chromium	25.5 J	0.13	mg/kg	SW846 6020	09/28/10	L7D0E1AN
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0039	
Cobalt	1.4	0.032	mg/kg	SW846 6020	09/28/10	L7D0E1AP
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.00097	
Copper	7.5	0.13	mg/kg	SW846 6020	09/28/10	L7D0E1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.021	

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MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

TOTAL Metals

Lot-Sample #...: C0I230506-003 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	3040 J	3.2	mg/kg	SW846 6020	09/28/10	L7D0E1AR
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.23	
Lead	7.8	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AT
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0025	
Manganese	97.8	0.032	mg/kg	SW846 6020	09/28/10	L7D0E1AU
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0067	
Nickel	2.6	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AV
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0073	
Selenium	0.22 ~~B~~ J	0.32	mg/kg	SW846 6020	09/28/10	L7D0E1AW
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.032	
Silver	0.029 ~~B~~ J	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1AX
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0025	
Thallium	0.033 ~~B J~~ J	0.065	mg/kg	SW846 6020	09/28/10	L7D0E1A0
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0013	
Tin	2.9	0.32	mg/kg	SW846 6020	09/28/10	L7D0E1A1
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.038	
Zinc	33.4	0.32	mg/kg	SW846 6020	09/28/10	L7D0E1A2
		Dilution Factor: 0.5		Analysis Time..: 20:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.042	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-004 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 59

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	0.63	0.040	mg/kg	SW846 7471A	09/27/10	L7D0F1AE
		Dilution Factor: 0.5		Analysis Time..: 10:08	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.013	
Prep Batch #...: 0271199						
Aluminum	12200 J	3.6	mg/kg	SW846 6020	09/28/10	L7D0F1AH
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.34	
Antimony	0.85 J	0.24	mg/kg	SW846 6020	09/28/10	L7D0F1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0031	
Arsenic	20.4 L	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AK
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.022	
Beryllium	0.91	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AL
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0091	
Cadmium	1.9	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AM
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0085	
Chromium	137 J	0.24	mg/kg	SW846 6020	09/28/10	L7D0F1AN
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0074	
Cobalt	15.1	0.061	mg/kg	SW846 6020	09/28/10	L7D0F1AP
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0018	
Copper	105	0.24	mg/kg	SW846 6020	09/28/10	L7D0F1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.040	

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NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-004 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	54900 J	6.1	mg/kg	SW846 6020	09/28/10	L7D0F1AR
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.43	
Lead	204	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AT
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0046	
Manganese	797	0.061	mg/kg	SW846 6020	09/28/10	L7D0F1AU
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.012	
Nickel	26.6	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AV
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.014	
Selenium	3.2	0.61	mg/kg	SW846 6020	09/28/10	L7D0F1AW
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.061	
Silver	0.69	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1AX
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0047	
Thallium	0.33 J	0.12	mg/kg	SW846 6020	09/28/10	L7D0F1A0
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0024	
Tin	36.7	0.61	mg/kg	SW846 6020	09/28/10	L7D0F1A1
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.072	
Zinc	650	0.61	mg/kg	SW846 6020	09/28/10	L7D0F1A2
		Dilution Factor: 0.5		Analysis Time..: 20:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.078	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-005 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 65

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	0.99	0.047	mg/kg	SW846 7471A	09/27/10	L7D0G1AE
		Dilution Factor: 0.5		Analysis Time..: 10:09	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.015	
Prep Batch #...: 0271199						
Aluminum	13900 J	4.2	mg/kg	SW846 6020	09/28/10	L7D0G1AH
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.40	
Antimony	1.7 J	0.28	mg/kg	SW846 6020	09/28/10	L7D0G1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0037	
Arsenic	27.1 L	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AK
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.026	
Beryllium	1.2	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AL
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.011	
Cadmium	3.1	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AM
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0099	
Chromium	320 J	0.28	mg/kg	SW846 6020	09/28/10	L7D0G1AN
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0086	
Cobalt	18.7	0.071	mg/kg	SW846 6020	09/28/10	L7D0G1AP
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0021	
Copper	168	0.28	mg/kg	SW846 6020	09/28/10	L7D0G1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.047	

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MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-005 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	71500 J	7.1	mg/kg	SW846 6020	09/28/10	L7D0G1AR
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.50	
Lead	260	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AT
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0054	
Manganese	707	0.071	mg/kg	SW846 6020	09/28/10	L7D0G1AU
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.015	
Nickel	38.6	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AV
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.016	
Selenium	4.9	0.71	mg/kg	SW846 6020	09/28/10	L7D0G1AW
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.071	
Silver	1.6	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1AX
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0055	
Thallium	0.53 J	0.14	mg/kg	SW846 6020	09/28/10	L7D0G1A0
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0028	
Tin	132	0.71	mg/kg	SW846 6020	09/28/10	L7D0G1A1
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.084	
Zinc	890	0.71	mg/kg	SW846 6020	09/28/10	L7D0G1A2
		Dilution Factor: 0.5		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.092	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

LW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-006 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 61

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	1.5	0.042	mg/kg	SW846 7471A	09/27/10	L7D0H1AE
		Dilution Factor: 0.5		Analysis Time..: 10:11	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.014	
Prep Batch #...: 0271199						
Aluminum	14900 J	3.8	mg/kg	SW846 6020	09/28/10	L7D0H1AH
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.36	
Antimony	2.1 J	0.25	mg/kg	SW846 6020	09/28/10	L7D0H1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0033	
Arsenic	91.4 L	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AK
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.023	
Beryllium	1.4	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AL
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0095	
Cadmium	6.2	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AM
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0089	
Chromium	301 J	0.25	mg/kg	SW846 6020	09/28/10	L7D0H1AN
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0078	
Cobalt	23.3	0.064	mg/kg	SW846 6020	09/28/10	L7D0H1AP
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0019	
Copper	197	0.25	mg/kg	SW846 6020	09/28/10	L7D0H1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.042	

(Continued on next page)

LW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-006 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	115000 J	31.8	mg/kg	SW846 6020	09/28-09/29/10	L7D0H1AR
		Dilution Factor: 2.5		Analysis Time..: 13:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 2.3	
Lead	2390	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AT
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0048	
Manganese	937	0.064	mg/kg	SW846 6020	09/28/10	L7D0H1AU
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.013	
Nickel	42.4	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AV
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.014	
Selenium	15.4	0.64	mg/kg	SW846 6020	09/28/10	L7D0H1AW
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.064	
Silver	2.7	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1AX
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0050	
Thallium	0.71 J	0.13	mg/kg	SW846 6020	09/28/10	L7D0H1A0
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0025	
Tin	35.5	0.64	mg/kg	SW846 6020	09/28/10	L7D0H1A1
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.075	
Zinc	2700	0.64	mg/kg	SW846 6020	09/28/10	L7D0H1A2
		Dilution Factor: 0.5		Analysis Time..: 20:50	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.082	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

kew 10/27/10

7

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-007 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 60

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	1.1	0.042	mg/kg	SW846 7471A	09/27/10	L7D0K1AE
		Dilution Factor: 0.5		Analysis Time..: 10:16	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.014	
Prep Batch #...: 0271199						
Aluminum	12600 J	3.8	mg/kg	SW846 6020	09/28/10	L7D0K1AH
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.36	
Antimony	1.4 J	0.25	mg/kg	SW846 6020	09/28/10	L7D0K1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0033	
Arsenic	42.7 L	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AK
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.023	
Beryllium	1.1	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AL
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0095	
Cadmium	4.2	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AM
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0088	
Chromium	292 J	0.25	mg/kg	SW846 6020	09/28/10	L7D0K1AN
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0077	
Cobalt	49.3	0.063	mg/kg	SW846 6020	09/28/10	L7D0K1AP
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0019	
Copper	385	0.25	mg/kg	SW846 6020	09/28/10	L7D0K1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.042	

(Continued on next page)

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-007 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	80300 J	31.6	mg/kg	SW846 6020	09/28-09/29/10	L7D0K1AR
		Dilution Factor: 2.5		Analysis Time..: 14:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 2.2	
Lead	457	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AT
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0048	
Manganese	1260	0.063	mg/kg	SW846 6020	09/28/10	L7D0K1AU
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.013	
Nickel	41.2	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AV
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.014	
Selenium	5.5	0.63	mg/kg	SW846 6020	09/28/10	L7D0K1AW
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.063	
Silver	1.7	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1AX
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0049	
Thallium	0.67 J	0.13	mg/kg	SW846 6020	09/28/10	L7D0K1A0
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0025	
Tin	151	0.63	mg/kg	SW846 6020	09/28/10	L7D0K1A1
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.075	
Zinc	1360	0.63	mg/kg	SW846 6020	09/28/10	L7D0K1A2
		Dilution Factor: 0.5		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.082	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-008 Matrix.....: SOLID
Date Sampled...: 09/22/10 Date Received..: 09/23/10
% Moisture.....: 69

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0270026						
Mercury	0.50	0.053	mg/kg	SW846 7471A	09/27/10	L7D0N1AE
		Dilution Factor: 0.5		Analysis Time..: 10:18	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0270016	MDL.....: 0.018	
Prep Batch #...: 0271199						
Aluminum	14000 J	4.8	mg/kg	SW846 6020	09/28/10	L7D0N1AH
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.46	
Antimony	0.79 J	0.32	mg/kg	SW846 6020	09/28/10	L7D0N1AJ
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0042	
Arsenic	15.8 L	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AK
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.029	
Beryllium	1.1	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AL
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.012	
Cadmium	1.6	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AM
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.011	
Chromium	108 J	0.32	mg/kg	SW846 6020	09/28/10	L7D0N1AN
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0098	
Cobalt	23.0	0.080	mg/kg	SW846 6020	09/28/10	L7D0N1AP
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0024	
Copper	80.9	0.32	mg/kg	SW846 6020	09/28/10	L7D0N1AQ
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.053	

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MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

TOTAL Metals

Lot-Sample #...: C0I230506-008 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	51200 J	8.0	mg/kg	SW846 6020	09/28/10	L7D0N1AR
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.57	
Lead	170	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AT
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0061	
Manganese	995	0.080	mg/kg	SW846 6020	09/28/10	L7D0N1AU
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.017	
Nickel	37.1	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AV
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.018	
Selenium	2.2	0.80	mg/kg	SW846 6020	09/28/10	L7D0N1AW
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.081	
Silver	0.65	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1AX
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0063	
Thallium	0.35 J	0.16	mg/kg	SW846 6020	09/28/10	L7D0N1A0
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.0032	
Tin	24.1	0.80	mg/kg	SW846 6020	09/28/10	L7D0N1A1
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.095	
Zinc	482	0.80	mg/kg	SW846 6020	09/28/10	L7D0N1A2
		Dilution Factor: 0.5		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0271113	MDL.....: 0.10	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

RW 10/27/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0I230506

Client: Maryland Environmental Service, Millersville, MD Date: October 27, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	EH4-00-10	C0I230506-001	Soil
1MS	EH4-00-10MS	C0I230506-001MS	Soil
1MSD	EH4-00-10MSD	C0I230506-001MSD	Soil
2	EH2-00-10	C0I230506-002	Soil
3	EH3-00-10	C0I230506-003	Soil
4	BH-SED-03C-00-10A	C0I230506-004	Soil
5	S-B1-00-10A	C0I230506-005	Soil
6	BH-SED-10-00-10A	C0I230506-006	Soil
7	SP09-03-00-10A	C0I230506-007	Soil
8	SP09-02-00-10A	C0I230506-008	Soil

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - The continuing calibration exhibited acceptable %D values.

Surrogates - All samples exhibited acceptable surrogate recoveries.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
1	PCB 156	OK/OK/42	None for RPD alone
	PCB 170	OK/OK/43	None for RPD alone
	PCB 180	47%/OK/OK	L/UL
	PCB 195	OK/OK/41	None for RPD alone
	PCB 206	OK/OK/41	None for RPD alone
	PCB 209	OK/OK/42	None for RPD alone

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC samples were not associated with the samples in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - Several compounds were flagged (PG) by the laboratory indicating that the percent difference (% D) between the original and confirmation analyses is greater then 40%. The reviewer flagged these and all results with >25% D as estimated (J).

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

GC Semivolatiles

Lot-Sample #....:	C0I230506-001	Work Order #...:	L7DX81A2	Matrix.....:	SOLID
Date Sampled....:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	15:55		
Dilution Factor:	1	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	27	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	**0.12 J ~~PG~~ J**	**0.23**	**ug/kg**	**0.048**
PCB 18 (BZ)	ND	0.23	ug/kg	0.032
PCB 28 (BZ)	**0.059 J ~~PG~~ J**	**0.23**	**ug/kg**	**0.052**
PCB 44 (BZ)	ND	0.23	ug/kg	0.047
PCB 49 (BZ)	ND	0.23	ug/kg	0.049
PCB 52 (BZ)	ND	0.23	ug/kg	0.046
PCB 66 (BZ)	ND	0.23	ug/kg	0.038
PCB 77 (BZ)	ND	0.23	ug/kg	0.050
PCB 87 (BZ)	ND	0.23	ug/kg	0.043
PCB 90 (BZ)	ND	0.23	ug/kg	0.035
PCB 101 (BZ)	ND	0.23	ug/kg	0.046
PCB 105 (BZ)	ND	0.23	ug/kg	0.048
PCB 118 (BZ)	ND	0.23	ug/kg	0.047
PCB 126 (BZ)	ND	0.23	ug/kg	0.060
PCB 128 (BZ)	ND	0.23	ug/kg	0.047
PCB 138 (BZ)	ND	0.23	ug/kg	0.049
PCB 153 (BZ)	ND	0.23	ug/kg	0.048
PCB 156 (BZ)	ND	0.23	ug/kg	0.047
PCB 169 (BZ)	ND	0.23	ug/kg	0.045
PCB 170 (BZ)	ND	0.23	ug/kg	0.047
PCB 180 (BZ)	~~ND~~ UL	0.23	ug/kg	0.047
PCB 183 (BZ)	ND	0.23	ug/kg	0.046
PCB 184 (BZ)	ND	0.23	ug/kg	0.040
PCB 187 (BZ)	ND	0.23	ug/kg	0.049
PCB 195 (BZ)	ND	0.23	ug/kg	0.047
PCB 206 (BZ)	ND	0.23	ug/kg	0.046
PCB 209 (BZ)	ND	0.23	ug/kg	0.049

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

CW 10/27/10

2

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

GC Semivolatiles

Lot-Sample #...:	C0I230506-002	Work Order #...:	L7D0D1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	17:10		
Dilution Factor:	0.98	Initial Wgt/Vol:	12.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	29	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	**0.17 J, ~~PG~~ J**	**0.23**	**ug/kg**	**0.048**
PCB 18 (BZ)	ND	0.23	ug/kg	0.031
PCB 28 (BZ)	**0.099 J, ~~PG~~ J**	**0.23**	**ug/kg**	**0.051**
PCB 44 (BZ)	ND	0.23	ug/kg	0.047
PCB 49 (BZ)	ND	0.23	ug/kg	0.048
PCB 52 (BZ)	ND	0.23	ug/kg	0.046
PCB 66 (BZ)	ND	0.23	ug/kg	0.038
PCB 77 (BZ)	ND	0.23	ug/kg	0.050
PCB 87 (BZ)	ND	0.23	ug/kg	0.043
PCB 90 (BZ)	ND	0.23	ug/kg	0.035
PCB 101 (BZ)	ND	0.23	ug/kg	0.046
PCB 105 (BZ)	ND	0.23	ug/kg	0.048
PCB 118 (BZ)	ND	0.23	ug/kg	0.047
PCB 126 (BZ)	ND	0.23	ug/kg	0.060
PCB 128 (BZ)	ND	0.23	ug/kg	0.047
PCB 138 (BZ)	ND	0.23	ug/kg	0.049
PCB 153 (BZ)	**0.11 ~~J~~ J**	**0.23**	**ug/kg**	**0.048**
PCB 156 (BZ)	ND	0.23	ug/kg	0.047
PCB 169 (BZ)	ND	0.23	ug/kg	0.045
PCB 170 (BZ)	ND	0.23	ug/kg	0.047
PCB 180 (BZ)	ND	0.23	ug/kg	0.047
PCB 183 (BZ)	ND	0.23	ug/kg	0.046
PCB 184 (BZ)	ND	0.23	ug/kg	0.040
PCB 187 (BZ)	ND	0.23	ug/kg	0.049
PCB 195 (BZ)	ND	0.23	ug/kg	0.046
PCB 206 (BZ)	ND	0.23	ug/kg	0.046
PCB 209 (BZ)	ND	0.23	ug/kg	0.049

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	57	(35 - 140)
PCB 205 (BZ)	62	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW 10/27/10

3

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

GC Semivolatiles

Lot-Sample #...:	C0I230506-003	Work Order #...:	L7D0E1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	17:35		
Dilution Factor:	1	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	23	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	**0.38 ~~PG~~ J**	**0.22**	**ug/kg**	**0.045**
PCB 18 (BZ)	ND	0.22	ug/kg	0.030
PCB 28 (BZ)	**0.16 ~~J,PG~~ J**	**0.22**	**ug/kg**	**0.048**
PCB 44 (BZ)	**0.098 J**	**0.22**	**ug/kg**	**0.044**
PCB 49 (BZ)	ND	0.22	ug/kg	0.046
PCB 52 (BZ)	**0.11 ~~J,PG~~ J**	**0.22**	**ug/kg**	**0.043**
PCB 66 (BZ)	**0.18 ~~J~~ J**	**0.22**	**ug/kg**	**0.035**
PCB 77 (BZ)	ND	0.22	ug/kg	0.047
PCB 87 (BZ)	**0.083 ~~J,PG~~ J**	**0.22**	**ug/kg**	**0.040**
PCB 90 (BZ)	ND	0.22	ug/kg	0.033
PCB 101 (BZ)	**0.15 J**	**0.22**	**ug/kg**	**0.044**
PCB 105 (BZ)	ND	0.22	ug/kg	0.045
PCB 118 (BZ)	**0.088 ~~J,PG~~ J**	**0.22**	**ug/kg**	**0.044**
PCB 126 (BZ)	ND	0.22	ug/kg	0.057
PCB 128 (BZ)	ND	0.22	ug/kg	0.044
PCB 138 (BZ)	**0.19 J**	**0.22**	**ug/kg**	**0.046**
PCB 153 (BZ)	**0.25**	**0.22**	**ug/kg**	**0.045**
PCB 156 (BZ)	ND	0.22	ug/kg	0.044
PCB 169 (BZ)	ND	0.22	ug/kg	0.043
PCB 170 (BZ)	**0.085 ~~J,PG~~ J**	**0.22**	**ug/kg**	**0.044**
PCB 180 (BZ)	ND	0.22	ug/kg	0.044
PCB 183 (BZ)	ND	0.22	ug/kg	0.043
PCB 184 (BZ)	ND	0.22	ug/kg	0.037
PCB 187 (BZ)	ND	0.22	ug/kg	0.046
PCB 195 (BZ)	ND	0.22	ug/kg	0.044
PCB 206 (BZ)	ND	0.22	ug/kg	0.043
PCB 209 (BZ)	**0.15 J**	**0.22**	**ug/kg**	**0.046**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	60	(35 - 140)
PCB 205 (BZ)	56	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW 10/27/10

4

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC Semivolatiles

Lot-Sample #...:	C0I230506-004	Work Order #...:	L7D0F1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	18:00		
Dilution Factor:	1	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	59	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	3.3 ~~PG~~ J	0.41	ug/kg	0.084
PCB 18 (BZ)	3.6	0.41	ug/kg	0.056
PCB 28 (BZ)	4.7 ~~PG~~ J	0.41	ug/kg	0.091
PCB 44 (BZ)	4.3 J	0.41	ug/kg	0.083
PCB 49 (BZ)	3.3 J	0.41	ug/kg	0.085
PCB 52 (BZ)	4.8	0.41	ug/kg	0.081
PCB 66 (BZ)	3.5 ~~PG~~ J	0.41	ug/kg	0.066
PCB 77 (BZ)	0.50 ~~PG~~ ↓	0.41	ug/kg	0.088
PCB 87 (BZ)	1.9 ~~PG~~	0.41	ug/kg	0.076
PCB 90 (BZ)	ND	0.41	ug/kg	0.062
PCB 101 (BZ)	3.6	0.41	ug/kg	0.082
PCB 105 (BZ)	2.1 J	0.41	ug/kg	0.085
PCB 118 (BZ)	3.4 J	0.41	ug/kg	0.083
PCB 126 (BZ)	ND	0.41	ug/kg	0.11
PCB 128 (BZ)	1.7 J	0.41	ug/kg	0.083
PCB 138 (BZ)	3.0 ~~PG~~ J	0.41	ug/kg	0.087
PCB 153 (BZ)	4.6 J	0.41	ug/kg	0.084
PCB 156 (BZ)	ND	0.41	ug/kg	0.082
PCB 169 (BZ)	ND	0.41	ug/kg	0.080
PCB 170 (BZ)	1.4 ~~PG~~ J	0.41	ug/kg	0.083
PCB 180 (BZ)	ND	0.41	ug/kg	0.083
PCB 183 (BZ)	1.3 J	0.41	ug/kg	0.081
PCB 184 (BZ)	ND	0.41	ug/kg	0.070
PCB 187 (BZ)	1.8 J	0.41	ug/kg	0.086
PCB 195 (BZ)	0.34 ~~J, PG~~ J	0.41	ug/kg	0.082
PCB 206 (BZ)	1.3	0.41	ug/kg	0.081
PCB 209 (BZ)	2.4 J	0.41	ug/kg	0.087

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	65	(35 - 140)
PCB 205 (BZ)	52	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

lcw 10/27/10

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EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

GC Semivolatiles

Lot-Sample #...:	C0I230506-005	Work Order #...:	L7D0G1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	18:25		
Dilution Factor:	1	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	65	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	15 ~~PG~~ J	0.48	ug/kg	0.098
PCB 18 (BZ)	6.6	0.48	ug/kg	0.065
PCB 28 (BZ)	12 ~~PG~~ J	0.48	ug/kg	0.11
PCB 44 (BZ)	11	0.48	ug/kg	0.097
PCB 49 (BZ)	9.1	0.48	ug/kg	0.10
PCB 52 (BZ)	12	0.48	ug/kg	0.094
PCB 66 (BZ)	11 ~~PG~~ J	0.48	ug/kg	0.077
PCB 77 (BZ)	ND	0.48	ug/kg	0.10
PCB 87 (BZ)	4.3 ~~PG~~ J	0.48	ug/kg	0.088
PCB 90 (BZ)	ND	0.48	ug/kg	0.072
PCB 101 (BZ)	7.8 ~~PG~~ J	0.48	ug/kg	0.095
PCB 105 (BZ)	6.0 J	0.48	ug/kg	0.099
PCB 118 (BZ)	10	0.48	ug/kg	0.097
PCB 126 (BZ)	ND	0.48	ug/kg	0.12
PCB 128 (BZ)	5.9 J	0.48	ug/kg	0.097
PCB 138 (BZ)	9.4 ~~PG~~ J	0.48	ug/kg	0.10
PCB 153 (BZ)	15	0.48	ug/kg	0.098
PCB 156 (BZ)	ND	0.48	ug/kg	0.096
PCB 169 (BZ)	ND	0.48	ug/kg	0.093
PCB 170 (BZ)	4.7 ~~PG~~ J	0.48	ug/kg	0.097
PCB 180 (BZ)	ND	0.48	ug/kg	0.097
PCB 183 (BZ)	1.9 ~~PG~~ J	0.48	ug/kg	0.094
PCB 184 (BZ)	ND	0.48	ug/kg	0.082
PCB 187 (BZ)	6.7 J	0.48	ug/kg	0.10
PCB 195 (BZ)	1.2 J	0.48	ug/kg	0.096
PCB 206 (BZ)	6.0	0.48	ug/kg	0.095
PCB 209 (BZ)	7.4 J	0.48	ug/kg	0.10

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	37	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

LW 10/27/10

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EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

GC Semivolatiles

Lot-Sample #...:	C0I230506-006	Work Order #...:	L7D0H1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/29/10		
Prep Batch #...:	0267059	Analysis Time..:	09:26		
Dilution Factor:	4.96	Initial Wgt/Vol:	12.1 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	61	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	**12 ~~PG~~ J**	**2.1**	**ug/kg**	**0.44**
PCB 18 (BZ)	ND	2.1	ug/kg	0.29
PCB 28 (BZ)	**0.87 ~~J,PG~~ J**	**2.1**	**ug/kg**	**0.47**
PCB 44 (BZ)	ND	2.1	ug/kg	0.43
PCB 49 (BZ)	ND	2.1	ug/kg	0.45
PCB 52 (BZ)	**1.5 J**	**2.1**	**ug/kg**	**0.42**
PCB 66 (BZ)	ND	2.1	ug/kg	0.35
PCB 77 (BZ)	ND	2.1	ug/kg	0.46
PCB 87 (BZ)	**0.88 ~~J,PG~~ J**	**2.1**	**ug/kg**	**0.39**
PCB 90 (BZ)	ND	2.1	ug/kg	0.32
PCB 101 (BZ)	**1.7 ~~J~~ J**	**2.1**	**ug/kg**	**0.43**
PCB 105 (BZ)	ND	2.1	ug/kg	0.44
PCB 118 (BZ)	**1.3 ~~J,PG~~ J**	**2.1**	**ug/kg**	**0.43**
PCB 126 (BZ)	ND	2.1	ug/kg	0.55
PCB 128 (BZ)	ND	2.1	ug/kg	0.43
PCB 138 (BZ)	**1.7 ~~J,PG~~ J**	**2.1**	**ug/kg**	**0.45**
PCB 153 (BZ)	**1.9 J**	**2.1**	**ug/kg**	**0.44**
PCB 156 (BZ)	ND	2.1	ug/kg	0.43
PCB 169 (BZ)	ND	2.1	ug/kg	0.42
PCB 170 (BZ)	**2.9 ~~PG~~ J**	**2.1**	**ug/kg**	**0.43**
PCB 180 (BZ)	ND	2.1	ug/kg	0.43
PCB 183 (BZ)	**1.7 ~~J,PG~~ J**	**2.1**	**ug/kg**	**0.42**
PCB 184 (BZ)	ND	2.1	ug/kg	0.36
PCB 187 (BZ)	**3.3 J**	**2.1**	**ug/kg**	**0.45**
PCB 195 (BZ)	ND	2.1	ug/kg	0.43
PCB 206 (BZ)	**20**	**2.1**	**ug/kg**	**0.42**
PCB 209 (BZ)	**80**	**2.1**	**ug/kg**	**0.45**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	51	(35 - 140)
PCB 205 (BZ)	84	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

[illegible] 10/27/10

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EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC Semivolatiles

Lot-Sample #...:	C0I230506-007	Work Order #...:	L7D0K1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/29/10		
Prep Batch #...:	0267059	Analysis Time..:	09:51		
Dilution Factor:	1.97	Initial Wgt/Vol:	12.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	60	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	5.7 ~~PG~~ J	0.85	ug/kg	0.17
PCB 18 (BZ)	13	0.85	ug/kg	0.11
PCB 28 (BZ)	18 ~~PG~~ J	0.85	ug/kg	0.19
PCB 44 (BZ)	16	0.85	ug/kg	0.17
PCB 49 (BZ)	13 J	0.85	ug/kg	0.18
PCB 52 (BZ)	19	0.85	ug/kg	0.17
PCB 66 (BZ)	ND	0.85	ug/kg	0.14
PCB 77 (BZ)	ND	0.85	ug/kg	0.18
PCB 87 (BZ)	7.0 ~~PG~~ J	0.85	ug/kg	0.16
PCB 90 (BZ)	ND	0.85	ug/kg	0.13
PCB 101 (BZ)	9.8 ~~PG~~ J	0.85	ug/kg	0.17
PCB 105 (BZ)	7.5	0.85	ug/kg	0.17
PCB 118 (BZ)	12 J	0.85	ug/kg	0.17
PCB 126 (BZ)	ND	0.85	ug/kg	0.22
PCB 128 (BZ)	5.7	0.85	ug/kg	0.17
PCB 138 (BZ)	11 ~~PG~~ J	0.85	ug/kg	0.18
PCB 153 (BZ)	15	0.85	ug/kg	0.17
PCB 156 (BZ)	2.6 ~~PG~~ J	0.85	ug/kg	0.17
PCB 169 (BZ)	ND	0.85	ug/kg	0.16
PCB 170 (BZ)	4.3 ~~PG~~ J	0.85	ug/kg	0.17
PCB 180 (BZ)	ND	0.85	ug/kg	0.17
PCB 183 (BZ)	1.9 ~~PG~~ J	0.85	ug/kg	0.17
PCB 184 (BZ)	ND	0.85	ug/kg	0.14
PCB 187 (BZ)	5.6 J	0.85	ug/kg	0.18
PCB 195 (BZ)	0.92 ~~PG~~ J	0.85	ug/kg	0.17
PCB 206 (BZ)	3.0	0.85	ug/kg	0.17
PCB 209 (BZ)	3.6 ~~PG~~	0.85	ug/kg	0.18

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	41	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

lw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

GC Semivolatiles

Lot-Sample #...:	C0I230506-008	Work Order #...:	L7D0N1AD	Matrix.....:	SOLID
Date Sampled...:	09/22/10	Date Received..:	09/23/10	MS Run #.....:	0267033
Prep Date.....:	09/24/10	Analysis Date..:	09/28/10		
Prep Batch #...:	0267059	Analysis Time..:	19:40		
Dilution Factor:	1	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	69	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	4.3 ~~PG~~ J	0.55	ug/kg	0.11
PCB 18 (BZ)	ND	0.55	ug/kg	0.074
PCB 28 (BZ)	3.1 ~~PG~~ J	0.55	ug/kg	0.12
PCB 44 (BZ)	2.5	0.55	ug/kg	0.11
PCB 49 (BZ)	3.2 J	0.55	ug/kg	0.11
PCB 52 (BZ)	3.7 J	0.55	ug/kg	0.11
PCB 66 (BZ)	ND	0.55	ug/kg	0.088
PCB 77 (BZ)	0.16 ~~J, PG~~ J	0.55	ug/kg	0.12
PCB 87 (BZ)	1.1 ~~PG~~ J	0.55	ug/kg	0.10
PCB 90 (BZ)	ND	0.55	ug/kg	0.082
PCB 101 (BZ)	2.8 ~~PG~~ J	0.55	ug/kg	0.11
PCB 105 (BZ)	1.8 J	0.55	ug/kg	0.11
PCB 118 (BZ)	3.1	0.55	ug/kg	0.11
PCB 126 (BZ)	ND	0.55	ug/kg	0.14
PCB 128 (BZ)	1.7 J	0.55	ug/kg	0.11
PCB 138 (BZ)	3.0 ~~PG~~ J	0.55	ug/kg	0.12
PCB 153 (BZ)	3.8 ~~PG~~ J	0.55	ug/kg	0.11
PCB 156 (BZ)	ND	0.55	ug/kg	0.11
PCB 169 (BZ)	ND	0.55	ug/kg	0.11
PCB 170 (BZ)	1.2 ~~PG~~ J	0.55	ug/kg	0.11
PCB 180 (BZ)	ND	0.55	ug/kg	0.11
PCB 183 (BZ)	0.61 ~~PG~~ J	0.55	ug/kg	0.11
PCB 184 (BZ)	ND	0.55	ug/kg	0.093
PCB 187 (BZ)	2.3 J	0.55	ug/kg	0.11
PCB 195 (BZ)	0.41 ~~J, PG~~ J	0.55	ug/kg	0.11
PCB 206 (BZ)	2.4	0.55	ug/kg	0.11
PCB 209 (BZ)	5.1 J	0.55	ug/kg	0.12

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	57	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

LW 10/27/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0I230506

Client: Maryland Environmental Service, Millersville, MD Date: October 27, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	EH4-00-10	C0I230506-001	Soil
1MS	EH4-00-10MS	C0I230506-001MS	Soil
1MSD	EH4-00-10MSD	C0I230506-001MSD	Soil
2	EH2-00-10	C0I230506-002	Soil
3	EH3-00-10	C0I230506-003	Soil
4	BH-SED-03C-00-10A	C0I230506-004	Soil
4DL	BH-SED-03C-00-10ADL	C0I230506-004DL	Soil
5	S-B1-00-10A	C0I230506-005	Soil
6	BH-SED-10-00-10A	C0I230506-006	Soil
7	SP09-03-00-10A	C0I230506-007	Soil
7DL	SP09-03-00-10ADL	C0I230506-007DL	Soil
8	SP09-02-00-10A	C0I230506-008	Soil

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 14 days for soil samples and analyzed within 40 days for all samples.

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
4DL	All Surrogates	NC DIL	None - Diluted out
7DL	All Surrogates	NC DIL	None - Diluted out
8	S4=2-Fluorophenol	24%	None for one out per fraction

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values.

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria except the following.

Sample ID	Internal Standard	Area Count	Qualifier
7	IS5= Chrysene-d12	Low	J/UJ- All associated compounds

Method Blank - The method blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - EDS Sample IDs 4 and 7 exhibited high concentrations of naphthalene and were flagged (E) by the laboratory. The samples were diluted and reanalyzed and the dilution results for naphthalene should be used for reporting.

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

GC/MS Semivolatiles

Lot-Sample #...:	C0I230506-001	**Work Order #...:**	L7DX81AC	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/29/10		
Prep Batch #...:	0267052	**Analysis Time..:**	22:55		
Dilution Factor:	1	**Initial Wgt/Vol:**	30 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	27	**Analyst ID.....:**	430261	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	920	ug/kg	190
1,2-Dichlorobenzene	ND	45	ug/kg	4.8
1,3-Dichlorobenzene	ND	45	ug/kg	3.6
1,4-Dichlorobenzene	ND	45	ug/kg	3.3
Benzoic acid	ND	230	ug/kg	19
Benzyl alcohol	ND	45	ug/kg	5.5
bis(2-Chloroethyl)-ether	ND	9.2	ug/kg	1.2
bis(2-Chloroethoxy) methane	ND	45	ug/kg	3.0
bis(2-Ethylhexyl) phthalate	**25 J**	**92**	**ug/kg**	**7.4**
4-Bromophenyl phenyl ether	ND	45	ug/kg	4.0
Butyl benzyl phthalate	**20 J**	**45**	**ug/kg**	**6.3**
4-Chloro-3-methylphenol	ND	45	ug/kg	4.2
2-Chloronaphthalene	ND	9.2	ug/kg	0.96
2-Chlorophenol	ND	45	ug/kg	3.8
4-Chlorophenyl phenyl ether	ND	45	ug/kg	5.1
Dibenzofuran	ND	45	ug/kg	4.5
Di-n-butyl phthalate	**6.3 J**	**45**	**ug/kg**	**5.7**
3,3'-Dichlorobenzidine	ND	45	ug/kg	4.9
2,4-Dichlorophenol	ND	9.2	ug/kg	0.92
Diethyl phthalate	ND	45	ug/kg	5.0
4,6-Dinitro-2-methylphenol	ND	230	ug/kg	18
2,4-Dimethylphenol	ND	45	ug/kg	7.2
Dimethyl phthalate	ND	45	ug/kg	5.0
2,4-Dinitrophenol	ND	230	ug/kg	55
2,4-Dinitrotoluene	ND	45	ug/kg	3.7
2,6-Dinitrotoluene	ND	45	ug/kg	4.7
1,2-Diphenylhydrazine	ND	45	ug/kg	5.9
Di-n-octyl phthalate	ND	45	ug/kg	4.8
Hexachlorobenzene	ND	9.2	ug/kg	0.98
Hexachlorobutadiene	ND	9.2	ug/kg	1.0
Hexachloroethane	ND	45	ug/kg	3.3

(Continued on next page)

NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-001 Work Order #...: L7DX81AC Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	45	ug/kg	4.9
Isophorone	ND	45	ug/kg	3.5
2-Methylphenol	ND	45	ug/kg	3.2
4-Methylphenol	ND	45	ug/kg	4.5
Nitrobenzene	ND	92	ug/kg	3.8
2-Nitrophenol	ND	45	ug/kg	5.1
4-Nitrophenol	ND	230	ug/kg	16
N-Nitrosodiphenylamine	ND	45	ug/kg	4.2
N-Nitrosodimethylamine	ND	45	ug/kg	3.9
N-Nitrosodi-n-propylamine	ND	9.2	ug/kg	1.1
2,2'-oxybis (1-Chloropropane)	ND	9.2	ug/kg	0.99
Pentachlorophenol	ND	45	ug/kg	4.1
Phenol	ND	9.2	ug/kg	1.1
1,2,4-Trichlorobenzene	ND	45	ug/kg	2.5
2,4,6-Trichlorophenol	ND	45	ug/kg	6.9
2-Methylnaphthalene	**0.90 J**	**9.2**	**ug/kg**	**0.83**
1-Methylnaphthalene	ND	9.2	ug/kg	0.98
Naphthalene	**3.0 J**	**9.2**	**ug/kg**	**0.79**
Acenaphthylene	ND	9.2	ug/kg	1.1
Acenaphthene	ND	9.2	ug/kg	0.88
Fluorene	ND	9.2	ug/kg	1.2
Phenanthrene	**3.6 J**	**9.2**	**ug/kg**	**1.5**
Anthracene	ND	9.2	ug/kg	0.90
Fluoranthene	**3.1 J**	**9.2**	**ug/kg**	**0.98**
Pyrene	**1.9 J**	**9.2**	**ug/kg**	**0.93**
Benzo(a)anthracene	**1.9 J**	**9.2**	**ug/kg**	**1.1**
Chrysene	**1.4 J**	**9.2**	**ug/kg**	**1.1**
Benzo(b)fluoranthene	**3.5 J**	**9.2**	**ug/kg**	**1.4**
Benzo(k)fluoranthene	ND	9.2	ug/kg	1.9
Benzo(a)pyrene	**21**	**9.2**	**ug/kg**	**0.92**
Indeno(1,2,3-cd)pyrene	**21**	**9.2**	**ug/kg**	**0.95**
Dibenzo(a,h)anthracene	ND	9.2	ug/kg	1.0
Benzo(ghi)perylene	**2.5 J**	**9.2**	**ug/kg**	**0.91**

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MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH4-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-001 **Work Order #...:** L7DX81AC **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	73	(27 - 110)
Terphenyl-d14	67	(21 - 130)
2-Fluorobiphenyl	67	(28 - 108)
2-Fluorophenol	71	(28 - 107)
Phenol-d5	79	(30 - 112)
2,4,6-Tribromophenol	69	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

hw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-002 **Work Order #...:** L7D0D1AG **Matrix.....:** SOLID
Date Sampled...: 09/22/10 **Date Received..:** 09/23/10 **MS Run #.....:** 0267028
Prep Date.....: 09/24/10 **Analysis Date..:** 09/29/10
Prep Batch #...: 0267052 **Analysis Time..:** 23:54
Dilution Factor: 0.99 **Initial Wgt/Vol:** 30.2 g **Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 29 **Analyst ID.....:** 430261 **Instrument ID..:** 732
Method.....: SW846 8270C

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	930	ug/kg	190
1,2-Dichlorobenzene	ND	46	ug/kg	4.9
1,3-Dichlorobenzene	ND	46	ug/kg	3.6
1,4-Dichlorobenzene	ND	46	ug/kg	3.3
Benzoic acid	ND	240	ug/kg	19
Benzyl alcohol	ND	46	ug/kg	5.6
bis(2-Chloroethyl)-ether	ND	9.3	ug/kg	1.2
bis(2-Chloroethoxy) methane	ND	46	ug/kg	3.0
bis(2-Ethylhexyl) phthalate	**21 J**	**93**	**ug/kg**	**7.5**
4-Bromophenyl phenyl ether	ND	46	ug/kg	4.0
Butyl benzyl phthalate	**17 J**	**46**	**ug/kg**	**6.3**
4-Chloro-3-methylphenol	ND	46	ug/kg	4.3
2-Chloronaphthalene	ND	9.3	ug/kg	0.97
2-Chlorophenol	ND	46	ug/kg	3.8
4-Chlorophenyl phenyl ether	ND	46	ug/kg	5.1
Dibenzofuran	ND	46	ug/kg	4.6
Di-n-butyl phthalate	ND	46	ug/kg	5.8
3,3'-Dichlorobenzidine	ND	46	ug/kg	4.9
2,4-Dichlorophenol	ND	9.3	ug/kg	0.93
Diethyl phthalate	**6.3 J**	**46**	**ug/kg**	**5.1**
4,6-Dinitro-2-methylphenol	ND	240	ug/kg	19
2,4-Dimethylphenol	ND	46	ug/kg	7.2
Dimethyl phthalate	ND	46	ug/kg	5.0
2,4-Dinitrophenol	ND	240	ug/kg	55
2,4-Dinitrotoluene	ND	46	ug/kg	3.7
2,6-Dinitrotoluene	ND	46	ug/kg	4.8
1,2-Diphenylhydrazine	ND	46	ug/kg	5.9
Di-n-octyl phthalate	ND	46	ug/kg	4.9
Hexachlorobenzene	ND	9.3	ug/kg	0.99
Hexachlorobutadiene	ND	9.3	ug/kg	1.0
Hexachloroethane	ND	46	ug/kg	3.3

(Continued on next page)

nwi 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-002 **Work Order #...:** L7D0D1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	46	ug/kg	5.0
Isophorone	ND	46	ug/kg	3.5
2-Methylphenol	ND	46	ug/kg	3.2
4-Methylphenol	ND	46	ug/kg	4.5
Nitrobenzene	ND	93	ug/kg	3.9
2-Nitrophenol	ND	46	ug/kg	5.1
4-Nitrophenol	ND	240	ug/kg	16
N-Nitrosodiphenylamine	ND	46	ug/kg	4.3
N-Nitrosodimethylamine	ND	46	ug/kg	4.0
N-Nitrosodi-n-propylamine	ND	9.3	ug/kg	1.1
2,2'-oxybis (1-Chloropropane)	ND	9.3	ug/kg	1.0
Pentachlorophenol	ND	46	ug/kg	4.1
Phenol	**7.2 J**	**9.3**	**ug/kg**	**1.1**
1,2,4-Trichlorobenzene	ND	46	ug/kg	2.6
2,4,6-Trichlorophenol	ND	46	ug/kg	6.9
2-Methylnaphthalene	**1.8 J**	**9.3**	**ug/kg**	**0.83**
1-Methylnaphthalene	ND	9.3	ug/kg	0.99
Naphthalene	**12**	**9.3**	**ug/kg**	**0.80**
Acenaphthylene	**1.1 J**	**9.3**	**ug/kg**	**1.1**
Acenaphthene	**1.1 J**	**9.3**	**ug/kg**	**0.89**
Fluorene	ND	9.3	ug/kg	1.2
Phenanthrene	**6.4 J**	**9.3**	**ug/kg**	**1.5**
Anthracene	**2.3 J**	**9.3**	**ug/kg**	**0.91**
Fluoranthene	**9.0 J**	**9.3**	**ug/kg**	**0.99**
Pyrene	**6.7 J**	**9.3**	**ug/kg**	**0.94**
Benzo(a)anthracene	**5.6 J**	**9.3**	**ug/kg**	**1.2**
Chrysene	**5.0 J**	**9.3**	**ug/kg**	**1.1**
Benzo(b)fluoranthene	**9.8**	**9.3**	**ug/kg**	**1.5**
Benzo(k)fluoranthene	**3.1 J**	**9.3**	**ug/kg**	**1.9**
Benzo(a)pyrene	**26**	**9.3**	**ug/kg**	**0.93**
Indeno(1,2,3-cd)pyrene	**25**	**9.3**	**ug/kg**	**0.95**
Dibenzo(a,h)anthracene	**25**	**9.3**	**ug/kg**	**1.0**
Benzo(ghi)perylene	**6.0 J**	**9.3**	**ug/kg**	**0.92**

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NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH2-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-002 **Work Order #...:** L7D0D1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	79	(27 - 110)
Terphenyl-d14	73	(21 - 130)
2-Fluorobiphenyl	75	(28 - 108)
2-Fluorophenol	73	(28 - 107)
Phenol-d5	85	(30 - 112)
2,4,6-Tribromophenol	75	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

hw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-003
Date Sampled...: 09/22/10
Prep Date.....: 09/24/10
Prep Batch #...: 0267052
Dilution Factor: 1
% Moisture.....: 23

Work Order #...: L7D0E1AG
Date Received..: 09/23/10
Analysis Date..: 09/30/10
Analysis Time..: 00:14
Initial Wgt/Vol: 30 g
Analyst ID.....: 430261
Method.....: SW846 8270C

Matrix.....: SOLID
MS Run #.....: 0267028
Final Wgt/Vol..: 0.5 mL
Instrument ID..: 732

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	870	ug/kg	180
1,2-Dichlorobenzene	ND	43	ug/kg	4.5
1,3-Dichlorobenzene	ND	43	ug/kg	3.4
1,4-Dichlorobenzene	ND	43	ug/kg	3.1
Benzoic acid	ND	220	ug/kg	18
Benzyl alcohol	ND	43	ug/kg	5.2
bis(2-Chloroethyl)-ether	ND	8.7	ug/kg	1.2
bis(2-Chloroethoxy) methane	ND	43	ug/kg	2.8
bis(2-Ethylhexyl) phthalate	**17 J**	**86**	**ug/kg**	**7.0**
4-Bromophenyl phenyl ether	ND	43	ug/kg	3.7
Butyl benzyl phthalate	**12 J**	**43**	**ug/kg**	**5.9**
4-Chloro-3-methylphenol	ND	43	ug/kg	4.0
2-Chloronaphthalene	ND	8.7	ug/kg	0.90
2-Chlorophenol	ND	43	ug/kg	3.5
4-Chlorophenyl phenyl ether	ND	43	ug/kg	4.8
Dibenzofuran	ND	43	ug/kg	4.2
Di-n-butyl phthalate	ND	43	ug/kg	5.4
3,3'-Dichlorobenzidine	ND	43	ug/kg	4.6
2,4-Dichlorophenol	ND	8.7	ug/kg	0.86
Diethyl phthalate	ND	43	ug/kg	4.7
4,6-Dinitro-2-methylphenol	ND	220	ug/kg	17
2,4-Dimethylphenol	ND	43	ug/kg	6.7
Dimethyl phthalate	ND	43	ug/kg	4.7
2,4-Dinitrophenol	ND	220	ug/kg	51
2,4-Dinitrotoluene	ND	43	ug/kg	3.5
2,6-Dinitrotoluene	ND	43	ug/kg	4.4
1,2-Diphenylhydrazine	ND	43	ug/kg	5.5
Di-n-octyl phthalate	ND	43	ug/kg	4.5
Hexachlorobenzene	ND	8.7	ug/kg	0.92
Hexachlorobutadiene	ND	8.7	ug/kg	0.96
Hexachloroethane	ND	43	ug/kg	3.1

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lw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-003 **Work Order #...:** L7D0E1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	43	ug/kg	4.6
Isophorone	ND	43	ug/kg	3.2
2-Methylphenol	ND	43	ug/kg	3.0
4-Methylphenol	ND	43	ug/kg	4.2
Nitrobenzene	ND	86	ug/kg	3.6
2-Nitrophenol	ND	43	ug/kg	4.7
4-Nitrophenol	ND	220	ug/kg	15
N-Nitrosodiphenylamine	ND	43	ug/kg	4.0
N-Nitrosodimethylamine	ND	43	ug/kg	3.7
N-Nitrosodi-n-propylamine	ND	8.7	ug/kg	1.0
2,2'-oxybis (1-Chloropropane)	ND	8.7	ug/kg	0.93
Pentachlorophenol	ND	43	ug/kg	3.9
Phenol	ND	8.7	ug/kg	1.0
1,2,4-Trichlorobenzene	ND	43	ug/kg	2.4
2,4,6-Trichlorophenol	ND	43	ug/kg	6.4
2-Methylnaphthalene	**2.0 J**	**8.7**	**ug/kg**	**0.77**
1-Methylnaphthalene	**0.93 J**	**8.7**	**ug/kg**	**0.92**
Naphthalene	**6.3 J**	**8.7**	**ug/kg**	**0.74**
Acenaphthylene	ND	8.7	ug/kg	0.99
Acenaphthene	**0.83 J**	**8.7**	**ug/kg**	**0.83**
Fluorene	ND	8.7	ug/kg	1.1
Phenanthrene	**5.8 J**	**8.7**	**ug/kg**	**1.4**
Anthracene	**2.2 J**	**8.7**	**ug/kg**	**0.84**
Fluoranthene	**12**	**8.7**	**ug/kg**	**0.92**
Pyrene	**8.6 J**	**8.7**	**ug/kg**	**0.87**
Benzo(a)anthracene	**5.2 J**	**8.7**	**ug/kg**	**1.1**
Chrysene	**6.4 J**	**8.7**	**ug/kg**	**1.0**
Benzo(b)fluoranthene	**13**	**8.7**	**ug/kg**	**1.4**
Benzo(k)fluoranthene	**2.3 J**	**8.7**	**ug/kg**	**1.7**
Benzo(a)pyrene	**24**	**8.7**	**ug/kg**	**0.86**
Indeno(1,2,3-cd)pyrene	**23**	**8.7**	**ug/kg**	**0.89**
Dibenzo(a,h)anthracene	**23**	**8.7**	**ug/kg**	**0.96**
Benzo(ghi)perylene	**7.2 J**	**8.7**	**ug/kg**	**0.86**

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KW 10/27/10

3

EA Engineering, Science and Technology

Client Sample ID: EH3-00-10

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-003 **Work Order #...:** L7D0E1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	78	(27 - 110)
Terphenyl-d14	69	(21 - 130)
2-Fluorobiphenyl	71	(28 - 108)
2-Fluorophenol	75	(28 - 107)
Phenol-d5	86	(30 - 112)
2,4,6-Tribromophenol	73	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

hw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

Lot-Sample #...:	C0I230506-004	**Work Order #...:**	L7D0F1AG	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/30/10		
Prep Batch #...:	0267052	**Analysis Time..:**	00:34		
Dilution Factor:	1.98	**Initial Wgt/Vol:**	30.3 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	59	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	3200	ug/kg	670
1,2-Dichlorobenzene	ND	160	ug/kg	17
1,3-Dichlorobenzene	ND	160	ug/kg	12
1,4-Dichlorobenzene	ND	160	ug/kg	11
Benzoic acid	ND	820	ug/kg	66
Benzyl alcohol	ND	160	ug/kg	19
bis(2-Chloroethyl)-ether	ND	32	ug/kg	4.3
bis(2-Chloroethoxy) methane	ND	160	ug/kg	11
bis(2-Ethylhexyl) phthalate	**180 J**	**320**	**ug/kg**	**26**
4-Bromophenyl phenyl ether	ND	160	ug/kg	14
Butyl benzyl phthalate	**59 J**	**160**	**ug/kg**	**22**
4-Chloro-3-methylphenol	ND	160	ug/kg	15
2-Chloronaphthalene	ND	32	ug/kg	3.3
2-Chlorophenol	ND	160	ug/kg	13
4-Chlorophenyl phenyl ether	ND	160	ug/kg	18
Dibenzofuran	**420**	**160**	**ug/kg**	**16**
Di-n-butyl phthalate	ND	160	ug/kg	20
3,3'-Dichlorobenzidine	ND	160	ug/kg	17
2,4-Dichlorophenol	ND	32	ug/kg	3.2
Diethyl phthalate	ND	160	ug/kg	17
4,6-Dinitro-2-methylphenol	ND	820	ug/kg	64
2,4-Dimethylphenol	ND	160	ug/kg	25
Dimethyl phthalate	ND	160	ug/kg	17
2,4-Dinitrophenol	ND	820	ug/kg	190
2,4-Dinitrotoluene	ND	160	ug/kg	13
2,6-Dinitrotoluene	ND	160	ug/kg	16
1,2-Diphenylhydrazine	ND	160	ug/kg	20
Di-n-octyl phthalate	ND	160	ug/kg	17
Hexachlorobenzene	ND	32	ug/kg	3.4
Hexachlorobutadiene	ND	32	ug/kg	3.6
Hexachloroethane	ND	160	ug/kg	11

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NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-004 **Work Order #...:** L7D0F1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	160	ug/kg	17
Isophorone	ND	160	ug/kg	12
2-Methylphenol	ND	160	ug/kg	11
4-Methylphenol	**55 J**	**160**	**ug/kg**	**16**
Nitrobenzene	ND	320	ug/kg	13
2-Nitrophenol	ND	160	ug/kg	18
4-Nitrophenol	ND	820	ug/kg	55
N-Nitrosodiphenylamine	ND	160	ug/kg	15
N-Nitrosodimethylamine	ND	160	ug/kg	14
N-Nitrosodi-n-propylamine	ND	32	ug/kg	3.8
2,2'-oxybis (1-Chloropropane)	ND	32	ug/kg	3.5
Pentachlorophenol	ND	160	ug/kg	14
Phenol	**34**	**32**	**ug/kg**	**3.8**
1,2,4-Trichlorobenzene	ND	160	ug/kg	8.8
2,4,6-Trichlorophenol	ND	160	ug/kg	24
2-Methylnaphthalene	**1100**	**32**	**ug/kg**	**2.9**
1-Methylnaphthalene	**510**	**32**	**ug/kg**	**3.4**
Naphthalene	25000 ~~**14000 E**~~	160 ~~**32**~~	**ug/kg**	14 ~~**2.8**~~
Acenaphthylene	**520**	**32**	**ug/kg**	**3.7**
Acenaphthene	**320**	**32**	**ug/kg**	**3.1**
Fluorene	**300**	**32**	**ug/kg**	**4.2**
Phenanthrene	**860**	**32**	**ug/kg**	**5.1**
Anthracene	**640**	**32**	**ug/kg**	**3.1**
Fluoranthene	**2800**	**32**	**ug/kg**	**3.4**
Pyrene	**2600**	**32**	**ug/kg**	**3.2**
Benzo(a)anthracene	**2200**	**32**	**ug/kg**	**4.0**
Chrysene	**1800**	**32**	**ug/kg**	**3.8**
Benzo(b)fluoranthene	**2000**	**32**	**ug/kg**	**5.0**
Benzo(k)fluoranthene	**1000**	**32**	**ug/kg**	**6.5**
Benzo(a)pyrene	**2100**	**32**	**ug/kg**	**3.2**
Indeno(1,2,3-cd)pyrene	**1300**	**32**	**ug/kg**	**3.3**
Dibenzo(a,h)anthracene	**490**	**32**	**ug/kg**	**3.6**
Benzo(ghi)perylene	**1700**	**32**	**ug/kg**	**3.2**

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ms 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-004 **Work Order #...:** L7D0F1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	82	(27 - 110)
Terphenyl-d14	83	(21 - 130)
2-Fluorobiphenyl	73	(28 - 108)
2-Fluorophenol	68	(28 - 107)
Phenol-d5	82	(30 - 112)
2,4,6-Tribromophenol	82	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

E Estimated result. Result concentration exceeds the calibration range.

hw 10/27/10

4DL

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

use original

Lot-Sample #...:	C0I230506-004	**Work Order #...:**	L7D0F2AG	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/30/10		
Prep Batch #...:	0267052	**Analysis Time..:**	11:34		
Dilution Factor:	9.9	**Initial Wgt/Vol:**	30.3 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	59	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	16000	ug/kg	3400
1,2-Dichlorobenzene	ND	790	ug/kg	84
1,3-Dichlorobenzene	ND	790	ug/kg	62
1,4-Dichlorobenzene	ND	790	ug/kg	57
Benzoic acid	ND	4100	ug/kg	330
Benzyl alcohol	ND	790	ug/kg	97
bis(2-Chloroethyl)-ether	ND	160	ug/kg	21
bis(2-Chloroethoxy) methane	ND	790	ug/kg	53
bis(2-Ethylhexyl) phthalate	ND	1600	ug/kg	130
4-Bromophenyl phenyl ether	ND	790	ug/kg	70
Butyl benzyl phthalate	ND	790	ug/kg	110
4-Chloro-3-methylphenol	ND	790	ug/kg	74
2-Chloronaphthalene	ND	160	ug/kg	17
2-Chlorophenol	ND	790	ug/kg	65
4-Chlorophenyl phenyl ether	ND	790	ug/kg	89
Dibenzofuran	**350 J**	**790**	**ug/kg**	**79**
Di-n-butyl phthalate	ND	790	ug/kg	100
3,3'-Dichlorobenzidine	ND	790	ug/kg	85
2,4-Dichlorophenol	ND	160	ug/kg	16
Diethyl phthalate	**110 J**	**790**	**ug/kg**	**87**
4,6-Dinitro-2-methylphenol	ND	4100	ug/kg	320
2,4-Dimethylphenol	ND	790	ug/kg	130
Dimethyl phthalate	ND	790	ug/kg	87
2,4-Dinitrophenol	ND	4100	ug/kg	950
2,4-Dinitrotoluene	ND	790	ug/kg	65
2,6-Dinitrotoluene	ND	790	ug/kg	82
1,2-Diphenylhydrazine	ND	790	ug/kg	100
Di-n-octyl phthalate	ND	790	ug/kg	84
Hexachlorobenzene	ND	160	ug/kg	17
Hexachlorobutadiene	ND	160	ug/kg	18
Hexachloroethane	ND	790	ug/kg	57

(Continued on next page)

LW 10/27/10

4DL

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

Use original

Lot-Sample #...: C0I230506-004 Work Order #...: L7D0F2AG Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	790	ug/kg	86
Isophorone	ND	790	ug/kg	60
2-Methylphenol	ND	790	ug/kg	56
4-Methylphenol	ND	790	ug/kg	78
Nitrobenzene	ND	1600	ug/kg	67
2-Nitrophenol	ND	790	ug/kg	88
4-Nitrophenol	ND	4100	ug/kg	270
N-Nitrosodiphenylamine	ND	790	ug/kg	74
N-Nitrosodimethylamine	ND	790	ug/kg	69
N-Nitrosodi-n-propylamine	ND	160	ug/kg	19
2,2'-oxybis (1-Chloropropane)	ND	160	ug/kg	17
Pentachlorophenol	ND	790	ug/kg	72
Phenol	ND	160	ug/kg	19
1,2,4-Trichlorobenzene	ND	790	ug/kg	44
2,4,6-Trichlorophenol	ND	790	ug/kg	120
2-Methylnaphthalene	**840**	**160**	**ug/kg**	**14**
1-Methylnaphthalene	**390**	**160**	**ug/kg**	**17**
Naphthalene	**25000**	**160**	**ug/kg**	**14**
Acenaphthylene	**360**	**160**	**ug/kg**	**18**
Acenaphthene	**260**	**160**	**ug/kg**	**15**
Fluorene	**330**	**160**	**ug/kg**	**21**
Phenanthrene	**860**	**160**	**ug/kg**	**25**
Anthracene	**510**	**160**	**ug/kg**	**16**
Fluoranthene	**3800**	**160**	**ug/kg**	**17**
Pyrene	**2900**	**160**	**ug/kg**	**16**
Benzo(a)anthracene	**1600**	**160**	**ug/kg**	**20**
Chrysene	**1600**	**160**	**ug/kg**	**19**
Benzo(b)fluoranthene	**1800**	**160**	**ug/kg**	**25**
Benzo(k)fluoranthene	**1100**	**160**	**ug/kg**	**32**
Benzo(a)pyrene	**2100**	**160**	**ug/kg**	**16**
Indeno(1,2,3-cd)pyrene	**970**	**160**	**ug/kg**	**16**
Dibenzo(a,h)anthracene	**260**	**160**	**ug/kg**	**18**
Benzo(ghi)perylene	**1100**	**160**	**ug/kg**	**16**

(Continued on next page)

[illegible] 10/27/10

4DL

EA Engineering, Science and Technology

Client Sample ID: BH-SED-03C-00-10A

GC/MS Semivolatiles

Use original

Lot-Sample #...: C0I230506-004 Work Order #...: L7D0F2AG Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

hw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

GC/MS Semivolatiles

Lot-Sample #...:	C0I230506-005	**Work Order #...:**	L7D0G1AG	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/30/10		
Prep Batch #...:	0267052	**Analysis Time..:**	01:14		
Dilution Factor:	4.97	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	65	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	9400	ug/kg	2000
1,2-Dichlorobenzene	ND	460	ug/kg	49
1,3-Dichlorobenzene	ND	460	ug/kg	37
1,4-Dichlorobenzene	ND	460	ug/kg	34
Benzoic acid	ND	2400	ug/kg	190
Benzyl alcohol	ND	460	ug/kg	57
bis(2-Chloroethyl)-ether	ND	94	ug/kg	13
bis(2-Chloroethoxy) methane	ND	460	ug/kg	31
bis(2-Ethylhexyl) phthalate	**920 J**	**940**	**ug/kg**	**76**
4-Bromophenyl phenyl ether	ND	460	ug/kg	41
Butyl benzyl phthalate	**130 J**	**460**	**ug/kg**	**64**
4-Chloro-3-methylphenol	ND	460	ug/kg	43
2-Chloronaphthalene	ND	94	ug/kg	9.8
2-Chlorophenol	ND	460	ug/kg	38
4-Chlorophenyl phenyl ether	ND	460	ug/kg	52
Dibenzofuran	**400 J**	**460**	**ug/kg**	**46**
Di-n-butyl phthalate	ND	460	ug/kg	59
3,3'-Dichlorobenzidine	ND	460	ug/kg	50
2,4-Dichlorophenol	ND	94	ug/kg	9.4
Diethyl phthalate	ND	460	ug/kg	51
4,6-Dinitro-2-methylphenol	ND	2400	ug/kg	190
2,4-Dimethylphenol	ND	460	ug/kg	73
Dimethyl phthalate	ND	460	ug/kg	51
2,4-Dinitrophenol	ND	2400	ug/kg	560
2,4-Dinitrotoluene	ND	460	ug/kg	38
2,6-Dinitrotoluene	ND	460	ug/kg	48
1,2-Diphenylhydrazine	ND	460	ug/kg	60
Di-n-octyl phthalate	ND	460	ug/kg	49
Hexachlorobenzene	ND	94	ug/kg	10
Hexachlorobutadiene	ND	94	ug/kg	11
Hexachloroethane	ND	460	ug/kg	34

(Continued on next page)

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-005 **Work Order #...:** L7D0G1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	460	ug/kg	51
Isophorone	ND	460	ug/kg	35
2-Methylphenol	ND	460	ug/kg	33
4-Methylphenol	**200 J**	**460**	**ug/kg**	**46**
Nitrobenzene	ND	940	ug/kg	39
2-Nitrophenol	ND	460	ug/kg	52
4-Nitrophenol	ND	2400	ug/kg	160
N-Nitrosodiphenylamine	ND	460	ug/kg	43
N-Nitrosodimethylamine	ND	460	ug/kg	40
N-Nitrosodi-n-propylamine	ND	94	ug/kg	11
2,2'-oxybis (1-Chloropropane)	ND	94	ug/kg	10
Pentachlorophenol	ND	460	ug/kg	42
Phenol	**81 J**	**94**	**ug/kg**	**11**
1,2,4-Trichlorobenzene	ND	460	ug/kg	26
2,4,6-Trichlorophenol	ND	460	ug/kg	70
2-Methylnaphthalene	**770**	**94**	**ug/kg**	**8.4**
1-Methylnaphthalene	**350**	**94**	**ug/kg**	**10**
Naphthalene	**13000**	**94**	**ug/kg**	**8.1**
Acenaphthylene	**860**	**94**	**ug/kg**	**11**
Acenaphthene	**210**	**94**	**ug/kg**	**9.0**
Fluorene	**340**	**94**	**ug/kg**	**12**
Phenanthrene	**1200**	**94**	**ug/kg**	**15**
Anthracene	**890**	**94**	**ug/kg**	**9.2**
Fluoranthene	**4100**	**94**	**ug/kg**	**10**
Pyrene	**6600**	**94**	**ug/kg**	**9.5**
Benzo(a)anthracene	**2600**	**94**	**ug/kg**	**12**
Chrysene	**2900**	**94**	**ug/kg**	**11**
Benzo(b)fluoranthene	**5100**	**94**	**ug/kg**	**15**
Benzo(k)fluoranthene	**2100**	**94**	**ug/kg**	**19**
Benzo(a)pyrene	**5300**	**94**	**ug/kg**	**9.4**
Indeno(1,2,3-cd)pyrene	**3500**	**94**	**ug/kg**	**9.7**
Dibenzo(a,h)anthracene	**1200**	**94**	**ug/kg**	**10**
Benzo(ghi)perylene	**5200**	**94**	**ug/kg**	**9.3**

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NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: S-B1-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-005 Work Order #...: L7D0G1AG Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	71	(27 - 110)
Terphenyl-d14	86	(21 - 130)
2-Fluorobiphenyl	75	(28 - 108)
2-Fluorophenol	62	(28 - 107)
Phenol-d5	78	(30 - 112)
2,4,6-Tribromophenol	76	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-006 **Work Order #...:** L7D0H1AG **Matrix.....:** SOLID
Date Sampled...: 09/22/10 **Date Received..:** 09/23/10 **MS Run #.....:** 0267028
Prep Date.....: 09/24/10 **Analysis Date..:** 09/30/10
Prep Batch #...: 0267052 **Analysis Time..:** 01:34
Dilution Factor: 5 **Initial Wgt/Vol:** 30 g **Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 61 **Analyst ID.....:** 430261 **Instrument ID..:** 732
Method.....: SW846 8270C

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	8500	ug/kg	1800
1,2-Dichlorobenzene	ND	420	ug/kg	44
1,3-Dichlorobenzene	ND	420	ug/kg	33
1,4-Dichlorobenzene	ND	420	ug/kg	30
Benzoic acid	ND	2200	ug/kg	180
Benzyl alcohol	ND	420	ug/kg	51
bis(2-Chloroethyl)-ether	ND	85	ug/kg	11
bis(2-Chloroethoxy) methane	ND	420	ug/kg	28
bis(2-Ethylhexyl) phthalate	ND	850	ug/kg	69
4-Bromophenyl phenyl ether	ND	420	ug/kg	37
Butyl benzyl phthalate	ND	420	ug/kg	58
4-Chloro-3-methylphenol	ND	420	ug/kg	39
2-Chloronaphthalene	ND	85	ug/kg	8.9
2-Chlorophenol	ND	420	ug/kg	35
4-Chlorophenyl phenyl ether	ND	420	ug/kg	47
Dibenzofuran	**690**	**420**	**ug/kg**	**42**
Di-n-butyl phthalate	ND	420	ug/kg	53
3,3'-Dichlorobenzidine	ND	420	ug/kg	45
2,4-Dichlorophenol	ND	85	ug/kg	8.5
Diethyl phthalate	ND	420	ug/kg	46
4,6-Dinitro-2-methylphenol	ND	2200	ug/kg	170
2,4-Dimethylphenol	ND	420	ug/kg	66
Dimethyl phthalate	ND	420	ug/kg	46
2,4-Dinitrophenol	ND	2200	ug/kg	510
2,4-Dinitrotoluene	ND	420	ug/kg	34
2,6-Dinitrotoluene	ND	420	ug/kg	44
1,2-Diphenylhydrazine	ND	420	ug/kg	54
Di-n-octyl phthalate	ND	420	ug/kg	45
Hexachlorobenzene	ND	85	ug/kg	9.0
Hexachlorobutadiene	ND	85	ug/kg	9.5
Hexachloroethane	ND	420	ug/kg	31

(Continued on next page)

NW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-006 **Work Order #...:** L7D0H1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	420	ug/kg	46
Isophorone	ND	420	ug/kg	32
2-Methylphenol	ND	420	ug/kg	30
4-Methylphenol	**120 J**	**420**	**ug/kg**	**42**
Nitrobenzene	ND	850	ug/kg	35
2-Nitrophenol	ND	420	ug/kg	47
4-Nitrophenol	ND	2200	ug/kg	140
N-Nitrosodiphenylamine	ND	420	ug/kg	39
N-Nitrosodimethylamine	ND	420	ug/kg	36
N-Nitrosodi-n-propylamine	ND	85	ug/kg	10
2,2'-oxybis (1-Chloropropane)	ND	85	ug/kg	9.2
Pentachlorophenol	ND	420	ug/kg	38
Phenol	**69 J**	**85**	**ug/kg**	**10**
1,2,4-Trichlorobenzene	ND	420	ug/kg	23
2,4,6-Trichlorophenol	ND	420	ug/kg	64
2-Methylnaphthalene	**1000**	**85**	**ug/kg**	**7.6**
1-Methylnaphthalene	**640**	**85**	**ug/kg**	**9.1**
Naphthalene	**12000**	**85**	**ug/kg**	**7.3**
Acenaphthylene	**2300**	**85**	**ug/kg**	**9.7**
Acenaphthene	**830**	**85**	**ug/kg**	**8.2**
Fluorene	**720**	**85**	**ug/kg**	**11**
Phenanthrene	**2000**	**85**	**ug/kg**	**13**
Anthracene	**1500**	**85**	**ug/kg**	**8.3**
Fluoranthene	**8200**	**85**	**ug/kg**	**9.1**
Pyrene	**8000**	**85**	**ug/kg**	**8.6**
Benzo(a)anthracene	**6600**	**85**	**ug/kg**	**11**
Chrysene	**5500**	**85**	**ug/kg**	**10**
Benzo(b)fluoranthene	**6000**	**85**	**ug/kg**	**13**
Benzo(k)fluoranthene	**2900**	**85**	**ug/kg**	**17**
Benzo(a)pyrene	**6200**	**85**	**ug/kg**	**8.5**
Indeno(1,2,3-cd)pyrene	**4700**	**85**	**ug/kg**	**8.7**
Dibenzo(a,h)anthracene	**1800**	**85**	**ug/kg**	**9.4**
Benzo(ghi)perylene	**6200**	**85**	**ug/kg**	**8.4**

(Continued on next page)

hw 10/27/10

EA Engineering, Science and Technology

Client Sample ID: BH-SED-10-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-006 **Work Order #...:** L7D0H1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	44	(27 - 110)
Terphenyl-d14	60	(21 - 130)
2-Fluorobiphenyl	49	(28 - 108)
2-Fluorophenol	36	(28 - 107)
Phenol-d5	46	(30 - 112)
2,4,6-Tribromophenol	42	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-007 **Work Order #...:** L7D0K1AG **Matrix.....:** SOLID
Date Sampled...: 09/22/10 **Date Received..:** 09/23/10 **MS Run #.....:** 0267028
Prep Date.....: 09/24/10 **Analysis Date..:** 09/30/10
Prep Batch #...: 0267052 **Analysis Time..:** 01:54
Dilution Factor: 4.95 **Initial Wgt/Vol:** 30.3 g **Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 60 **Analyst ID.....:** 430261 **Instrument ID..:** 732
Method.....: SW846 8270C

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	8400	ug/kg	1700
1,2-Dichlorobenzene	ND	410	ug/kg	44
1,3-Dichlorobenzene	ND	410	ug/kg	32
1,4-Dichlorobenzene	ND	410	ug/kg	30
Benzoic acid	ND	2100	ug/kg	170
Benzyl alcohol	ND	410	ug/kg	50
bis(2-Chloroethyl)-ether	ND	84	ug/kg	11
bis(2-Chloroethoxy) methane	ND	410	ug/kg	27
bis(2-Ethylhexyl) phthalate	**1700 J**	**830**	**ug/kg**	**67**
4-Bromophenyl phenyl ether	ND	410	ug/kg	36
Butyl benzyl phthalate	~~ND~~ UJ	410	ug/kg	57
4-Chloro-3-methylphenol	ND	410	ug/kg	38
2-Chloronaphthalene	ND	84	ug/kg	8.7
2-Chlorophenol	ND	410	ug/kg	34
4-Chlorophenyl phenyl ether	ND	410	ug/kg	46
Dibenzofuran	**2000**	**410**	**ug/kg**	**41**
Di-n-butyl phthalate	ND	410	ug/kg	52
3,3'-Dichlorobenzidine	~~ND~~ UJ	410	ug/kg	44
2,4-Dichlorophenol	ND	84	ug/kg	8.4
Diethyl phthalate	ND	410	ug/kg	46
4,6-Dinitro-2-methylphenol	ND	2100	ug/kg	170
2,4-Dimethylphenol	ND	410	ug/kg	65
Dimethyl phthalate	ND	410	ug/kg	45
2,4-Dinitrophenol	ND	2100	ug/kg	500
2,4-Dinitrotoluene	ND	410	ug/kg	34
2,6-Dinitrotoluene	ND	410	ug/kg	43
1,2-Diphenylhydrazine	ND	410	ug/kg	53
Di-n-octyl phthalate	ND	410	ug/kg	44
Hexachlorobenzene	ND	84	ug/kg	8.9
Hexachlorobutadiene	ND	84	ug/kg	9.3
Hexachloroethane	ND	410	ug/kg	30

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LW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-007 **Work Order #...:** L7D0K1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	410	ug/kg	45
Isophorone	ND	410	ug/kg	31
2-Methylphenol	ND	410	ug/kg	29
4-Methylphenol	**200 J**	**410**	**ug/kg**	**41**
Nitrobenzene	ND	830	ug/kg	35
2-Nitrophenol	ND	410	ug/kg	46
4-Nitrophenol	ND	2100	ug/kg	140
N-Nitrosodiphenylamine	ND	410	ug/kg	39
N-Nitrosodimethylamine	ND	410	ug/kg	36
N-Nitrosodi-n-propylamine	ND	84	ug/kg	9.8
2,2'-oxybis (1-Chloropropane)	ND	84	ug/kg	9.0
Pentachlorophenol	ND	410	ug/kg	37
Phenol	**96**	**84**	**ug/kg**	**9.9**
1,2,4-Trichlorobenzene	ND	410	ug/kg	23
2,4,6-Trichlorophenol	ND	410	ug/kg	62
2-Methylnaphthalene	**3000**	**84**	**ug/kg**	**7.5**
1-Methylnaphthalene	**1300**	**84**	**ug/kg**	**8.9**
Naphthalene	110000 ~~**45000 E**~~	840 ~~**84**~~	~~**ug/kg**~~	72 ~~**7.2**~~
Acenaphthylene	**2200**	**84**	**ug/kg**	**9.6**
Acenaphthene	**1600**	**84**	**ug/kg**	**8.0**
Fluorene	**2000**	**84**	**ug/kg**	**11**
Phenanthrene	**6200**	**84**	**ug/kg**	**13**
Anthracene	**4500**	**84**	**ug/kg**	**8.2**
Fluoranthene	**14000**	**84**	**ug/kg**	**8.9**
Pyrene	**15000** J	**84**	**ug/kg**	**8.4**
Benzo(a)anthracene	**11000** J	**84**	**ug/kg**	**10**
Chrysene	**9600** J	**84**	**ug/kg**	**9.9**
Benzo(b)fluoranthene	**9400**	**84**	**ug/kg**	**13**
Benzo(k)fluoranthene	**4400**	**84**	**ug/kg**	**17**
Benzo(a)pyrene	**9100**	**84**	**ug/kg**	**8.4**
Indeno(1,2,3-cd)pyrene	**6400**	**84**	**ug/kg**	**8.6**
Dibenzo(a,h)anthracene	**2300**	**84**	**ug/kg**	**9.3**
Benzo(ghi)perylene	**8600**	**84**	**ug/kg**	**8.3**

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LW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-007 **Work Order #...:** L7D0K1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	79	(27 - 110)
Terphenyl-d14	92	(21 - 130)
2-Fluorobiphenyl	73	(28 - 108)
2-Fluorophenol	46	(28 - 107)
Phenol-d5	68	(30 - 112)
2,4,6-Tribromophenol	70	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

E Estimated result. Result concentration exceeds the calibration range.

UW 10/27/10

70L

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC/MS Semivolatiles

Use original

Lot-Sample #...:	C0I230506-007	**Work Order #...:**	L7D0K2AG	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/30/10		
Prep Batch #...:	0267052	**Analysis Time..:**	12:15		
Dilution Factor:	49.5	**Initial Wgt/Vol:**	30.3 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	60	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	84000	ug/kg	17000
1,2-Dichlorobenzene	ND	4100	ug/kg	440
1,3-Dichlorobenzene	ND	4100	ug/kg	320
1,4-Dichlorobenzene	ND	4100	ug/kg	300
Benzoic acid	ND	21000	ug/kg	1700
Benzyl alcohol	ND	4100	ug/kg	500
bis(2-Chloroethyl)-ether	ND	840	ug/kg	110
bis(2-Chloroethoxy) methane	ND	4100	ug/kg	270
bis(2-Ethylhexyl) phthalate	**1800 J**	**8300**	**ug/kg**	**670**
4-Bromophenyl phenyl ether	ND	4100	ug/kg	360
Butyl benzyl phthalate	ND	4100	ug/kg	570
4-Chloro-3-methylphenol	ND	4100	ug/kg	380
2-Chloronaphthalene	ND	840	ug/kg	87
2-Chlorophenol	ND	4100	ug/kg	340
4-Chlorophenyl phenyl ether	ND	4100	ug/kg	460
Dibenzofuran	**2200 J**	**4100**	**ug/kg**	**410**
Di-n-butyl phthalate	ND	4100	ug/kg	520
3,3'-Dichlorobenzidine	ND	4100	ug/kg	440
2,4-Dichlorophenol	ND	840	ug/kg	84
Diethyl phthalate	**1400 J**	**4100**	**ug/kg**	**460**
4,6-Dinitro-2-methylphenol	ND	21000	ug/kg	1700
2,4-Dimethylphenol	ND	4100	ug/kg	650
Dimethyl phthalate	ND	4100	ug/kg	450
2,4-Dinitrophenol	ND	21000	ug/kg	5000
2,4-Dinitrotoluene	ND	4100	ug/kg	340
2,6-Dinitrotoluene	ND	4100	ug/kg	430
1,2-Diphenylhydrazine	ND	4100	ug/kg	530
Di-n-octyl phthalate	ND	4100	ug/kg	440
Hexachlorobenzene	ND	840	ug/kg	89
Hexachlorobutadiene	ND	840	ug/kg	93
Hexachloroethane	ND	4100	ug/kg	300

(Continued on next page)

LW 10/27/10

7DL

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

GC/MS Semivolatiles

Use original

Lot-Sample #...: C0I230506-007 Work Order #...: L7D0K2AG Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	4100	ug/kg	450
Isophorone	ND	4100	ug/kg	310
2-Methylphenol	ND	4100	ug/kg	290
4-Methylphenol	ND	4100	ug/kg	410
Nitrobenzene	ND	8300	ug/kg	350
2-Nitrophenol	ND	4100	ug/kg	460
4-Nitrophenol	ND	21000	ug/kg	1400
N-Nitrosodiphenylamine	ND	4100	ug/kg	390
N-Nitrosodimethylamine	ND	4100	ug/kg	360
N-Nitrosodi-n-propylamine	ND	840	ug/kg	98
2,2'-oxybis (1-Chloropropane)	ND	840	ug/kg	90
Pentachlorophenol	ND	4100	ug/kg	370
Phenol	ND	840	ug/kg	99
1,2,4-Trichlorobenzene	ND	4100	ug/kg	230
2,4,6-Trichlorophenol	ND	4100	ug/kg	620
2-Methylnaphthalene	**3000**	**840**	**ug/kg**	**75**
1-Methylnaphthalene	**1300**	**840**	**ug/kg**	**89**
Naphthalene	**110000**	**840**	**ug/kg**	**72**
Acenaphthylene	**1700**	**840**	**ug/kg**	**96**
Acenaphthene	**1700**	**840**	**ug/kg**	**80**
Fluorene	**2300**	**840**	**ug/kg**	**110**
Phenanthrene	**8700**	**840**	**ug/kg**	**130**
Anthracene	**5700**	**840**	**ug/kg**	**82**
Fluoranthene	**27000**	**840**	**ug/kg**	**89**
Pyrene	**20000**	**840**	**ug/kg**	**84**
Benzo(a)anthracene	**12000**	**840**	**ug/kg**	**100**
Chrysene	**11000**	**840**	**ug/kg**	**99**
Benzo(b)fluoranthene	**12000**	**840**	**ug/kg**	**130**
Benzo(k)fluoranthene	**6500**	**840**	**ug/kg**	**170**
Benzo(a)pyrene	**14000**	**840**	**ug/kg**	**84**
Indeno(1,2,3-cd)pyrene	**6200**	**840**	**ug/kg**	**86**
Dibenzo(a,h)anthracene	**1600**	**840**	**ug/kg**	**93**
Benzo(ghi)perylene	**6800**	**840**	**ug/kg**	**83**

(Continued on next page)

NW 10/27/10

7DL

EA Engineering, Science and Technology

Client Sample ID: SP09-03-00-10A

use original

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-007 **Work Order #...:** L7D0K2AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

LW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

GC/MS Semivolatiles

Lot-Sample #...:	C0I230506-008	**Work Order #...:**	L7D0N1AG	**Matrix.....:**	SOLID
Date Sampled...:	09/22/10	**Date Received..:**	09/23/10	**MS Run #.....:**	0267028
Prep Date.....:	09/24/10	**Analysis Date..:**	09/30/10		
Prep Batch #...:	0267052	**Analysis Time..:**	00:54		
Dilution Factor:	1.99	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	69	**Analyst ID.....:**	430261	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	4300	ug/kg	900
1,2-Dichlorobenzene	ND	210	ug/kg	22
1,3-Dichlorobenzene	ND	210	ug/kg	17
1,4-Dichlorobenzene	ND	210	ug/kg	15
Benzoic acid	ND	1100	ug/kg	89
Benzyl alcohol	ND	210	ug/kg	26
bis(2-Chloroethyl)-ether	ND	43	ug/kg	5.7
bis(2-Chloroethoxy) methane	ND	210	ug/kg	14
bis(2-Ethylhexyl) phthalate	**130 J**	**430**	**ug/kg**	**35**
4-Bromophenyl phenyl ether	ND	210	ug/kg	19
Butyl benzyl phthalate	**41 J**	**210**	**ug/kg**	**29**
4-Chloro-3-methylphenol	ND	210	ug/kg	20
2-Chloronaphthalene	ND	43	ug/kg	4.5
2-Chlorophenol	ND	210	ug/kg	17
4-Chlorophenyl phenyl ether	ND	210	ug/kg	24
Dibenzofuran	**260**	**210**	**ug/kg**	**21**
Di-n-butyl phthalate	ND	210	ug/kg	27
3,3'-Dichlorobenzidine	ND	210	ug/kg	23
2,4-Dichlorophenol	ND	43	ug/kg	4.3
Diethyl phthalate	**53 J**	**210**	**ug/kg**	**23**
4,6-Dinitro-2-methylphenol	ND	1100	ug/kg	86
2,4-Dimethylphenol	ND	210	ug/kg	33
Dimethyl phthalate	ND	210	ug/kg	23
2,4-Dinitrophenol	ND	1100	ug/kg	250
2,4-Dinitrotoluene	ND	210	ug/kg	17
2,6-Dinitrotoluene	ND	210	ug/kg	22
1,2-Diphenylhydrazine	ND	210	ug/kg	27
Di-n-octyl phthalate	ND	210	ug/kg	23
Hexachlorobenzene	ND	43	ug/kg	4.6
Hexachlorobutadiene	ND	43	ug/kg	4.8
Hexachloroethane	ND	210	ug/kg	15

(Continued on next page)

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-008 **Work Order #...:** L7D0N1AG **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	210	ug/kg	23
Isophorone	ND	210	ug/kg	16
2-Methylphenol	ND	210	ug/kg	15
4-Methylphenol	**78 J**	**210**	**ug/kg**	**21**
Nitrobenzene	ND	430	ug/kg	18
2-Nitrophenol	ND	210	ug/kg	24
4-Nitrophenol	ND	1100	ug/kg	73
N-Nitrosodiphenylamine	ND	210	ug/kg	20
N-Nitrosodimethylamine	ND	210	ug/kg	18
N-Nitrosodi-n-propylamine	ND	43	ug/kg	5.0
2,2'-oxybis (1-Chloropropane)	ND	43	ug/kg	4.6
Pentachlorophenol	ND	210	ug/kg	19
Phenol	**33 J**	**43**	**ug/kg**	**5.0**
1,2,4-Trichlorobenzene	ND	210	ug/kg	12
2,4,6-Trichlorophenol	ND	210	ug/kg	32
2-Methylnaphthalene	**320**	**43**	**ug/kg**	**3.8**
1-Methylnaphthalene	**150**	**43**	**ug/kg**	**4.6**
Naphthalene	**4300**	**43**	**ug/kg**	**3.7**
Acenaphthylene	**370**	**43**	**ug/kg**	**4.9**
Acenaphthene	**180**	**43**	**ug/kg**	**4.1**
Fluorene	**220**	**43**	**ug/kg**	**5.6**
Phenanthrene	**900**	**43**	**ug/kg**	**6.8**
Anthracene	**660**	**43**	**ug/kg**	**4.2**
Fluoranthene	**2000**	**43**	**ug/kg**	**4.6**
Pyrene	**1800**	**43**	**ug/kg**	**4.3**
Benzo(a)anthracene	**1500**	**43**	**ug/kg**	**5.4**
Chrysene	**1500**	**43**	**ug/kg**	**5.1**
Benzo(b)fluoranthene	**1800**	**43**	**ug/kg**	**6.7**
Benzo(k)fluoranthene	**870**	**43**	**ug/kg**	**8.6**
Benzo(a)pyrene	**1900**	**43**	**ug/kg**	**4.3**
Indeno(1,2,3-cd)pyrene	**1300**	**43**	**ug/kg**	**4.4**
Dibenzo(a,h)anthracene	**480**	**43**	**ug/kg**	**4.8**
Benzo(ghi)perylene	**1600**	**43**	**ug/kg**	**4.3**

(Continued on next page)

MW 10/27/10

EA Engineering, Science and Technology

Client Sample ID: SP09-02-00-10A

GC/MS Semivolatiles

Lot-Sample #...: C0I230506-008 **Work Order #...:** L7D0N1AG **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	36	(27 - 110)
Terphenyl-d14	74	(21 - 130)
2-Fluorobiphenyl	58	(28 - 108)
2-Fluorophenol	24 *	(28 - 107)
Phenol-d5	48	(30 - 112)
2,4,6-Tribromophenol	68	(21 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

MW 10/27/10

ENVIRONMENTAL
Data Services, Inc.

TOTAL ORGANIC CARBON (TOC)

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0I230506

Client: Maryland Environmental Service, Millersville, MD Date: October 27, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	EH4-00-10	C0I230506-001	Soil
2	EH2-00-10	C0I230506-002	Soil
3	EH3-00-10	C0I230506-003	Soil
4	BH-SED-03C-00-10A	C0I230506-004	Soil
5	S-B1-00-10A	C0I230506-005	Soil
6	BH-SED-10-00-10A	C0I230506-006	Soil
7	SP09-03-00-10A	C0I230506-007	Soil
8	SP09-02-00-10A	C0I230506-008	Soil

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, was used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within the recommended holding times for all of the above wet chemistry parameters.

Calibration - The ICV and CCV %R values were acceptable.

Method and Calibration Blanks - The method blanks and continuing calibration blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - A MS/MSD sample was not analyzed from this data package.

LCS - The LCS samples exhibited acceptable %R values.

Field Duplicates - Field duplicate samples were not included in this package.

Compound Quantitation - Several samples were analyzed at a dilution due to high concentrations of target compounds (TOC).

All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

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MES/EA Sparrows Point

TOC

Lab Name: TESTAMERICA PITTSBURGH **Method:** EPA Lloyd Kahn

Client Name: EA Engineering, Science and Technology **Lot Number:** C0I230506

Matrix: SOLID

Total Organic Carbon by Lloyd Kahn

Client Sample ID	Sample Number	Workorder	Result	Units	Method Detection Limit	Reporting Limit	Dilution Factor	Prep Date - Analysis Date/Time	QC Batch	EDS #
EH4-00-10	C0I230506 001	L7DX81A0	ND	mg/kg	345	1270	0.92	9/29/2010 - 9/30/2010 00:34	0272095	1
EH2-00-10	C0I230506 002	L7D0D1AA	ND	mg/kg	363	1330	0.95	9/29/2010 - 9/30/2010 01:03	0272095	2
EH3-00-10	C0I230506 003	L7D0E1AA	J 896	mg/kg	327	1200	0.93	9/29/2010 - 9/30/2010 02:15	0272095	3
BH-SED-03C-00-10A	C0I230506 004	L7D0F1AA	50100	mg/kg	1210	4430	1.83	9/25/2010 - 9/27/2010 19:18	0266306	4
S-B1-00-10A	C0I230506 005	L7D0G1AA	63200	mg/kg	1540	5660	2	9/25/2010 - 9/27/2010 19:47	0266306	5
BH-SED-10-00-10A	C0I230506 006	L7D0H1AA	98400	mg/kg	1460	5370	2.11	9/25/2010 - 9/27/2010 20:16	0266306	6
SP09-03-00-10A	C0I230506 007	L7D0K1AA	62100	mg/kg	1300	4780	1.89	9/25/2010 - 9/27/2010 20:46	0266306	7
SP09-02-00-10A	C0I230506 008	L7D0N1AA	44000	mg/kg	1640	6020	1.87	9/25/2010 - 9/27/2010 21:15	0266306	8

MW 10/27/10

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0J060466

Karin Olsen

EA Engineering, Science and Te
15 Loveton Circle
Sparks, MD 21152

TESTAMERICA LABORATORIES, INC.

Carrie L. Gamber
Project Manager

November 4, 2010

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW –	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J060466

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on October 6, 2010. The cooler was received within the proper temperature range.

Note: The initial weight extracted for the sediment samples was adjusted to account for the percent moisture of each sample whenever possible.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Due to difficulty in separating benzo(b)fluoranthene and benzo(k)fluoranthene for several samples, the positive results in these samples were reported as benzo(b)fluoranthene and non-detect for benzo(k)fluoranthene.

Due to the concentration of target compounds detected and/or matrix, several samples were analyzed at a dilution.

Sample CP-SED-COMP had the surrogates diluted out.

Sample RB100510A had surrogate 2,4,6-tribromophenol recover low and outside of the control limits. The method blank and laboratory control duplicate associated with this sample had surrogate 2-fluorophenol recover low and outside of the control limits. The laboraotry control duplicate also had compounds recover low and outside of the control limits. The sample was re-extracted outside of the holding time. All surrogates recovered within the control limits on the re-extract. The results of the original and the re-extract did not match. Both sets of data are reported.

The matrix spike and matrix spike duplicate had the surrogates and the spikes diluted out.

The method blank for batch 0282028 had compounds detected between the MDL and the reporting limits. The results were flagged with a "J" qualifier. Any sample in this batch that had these same compounds detected had the results flagged with a "B" qualifier.

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J060466

PCB Congeners:
Due to the concentration of target compounds detected, samples CP-SED-COMP and the SRM were analyzed at a dilution.

The SRM had the surrogates diluted out.

The matrix spike and matrix spike duplicate recovered outside of the control limits for several compounds.

The recovery of PCB 8 was not calculated for the matrix spike and the matrix spike duplicate due to matrix interference.

The relative percent difference between the matrix spike and the matrix spike duplicate was outside of the control limit for several compounds.

Metals:
The serial dilution of sample CP-SED-COMP was outside of the percent difference control limits for antimony. The result was flagged with an "E" qualifier.

Sample CP-SED-COMP was over the instruments linear range for iron and required a dilution.

The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

For the matrix spike and matrix spike duplicate, aluminum, arsenic, chromium, copper, iron, lead, manganese, selenium, zinc, and mercury recoveries were not calculated due to the concentration of analyte in the sample being >4 times the concentration of spike added.

The matrix spike and matrix spike duplicate recovered outside of the control limits for antimony.

General Chemistry:
The matrix spikes did not recover for hexavalent chromium. The samples were re-digested and re-analyzed. The matrix spikes again did not recover confirming matrix interference. Both sets of data are reported.

TestAmerica's Burlington laboratory performed the grain size analysis. All data is included in the package.

METHODS SUMMARY

C0J060466

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Hexavalent Chromium	SW846 7196A	SW846 3060A
ICP-MS (6020)	SW846 6020	SW846 3010
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Liquid Waste (Manual Cold-Vapor)	SW846 7470A	SW846 7470A
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
PCB Congeners by SW-846 8082	SW846 8082 Cong	SW846 3510C/366
PCB Congeners by SW-846 8082	SW846 8082 Cong	SW846 3541 SOXH
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	
Total Residue as Percent Solids	SM20 2540G	
TOC Lloyd Kahn Lloyd Kahn	EPA Lloyd Kahn	EPA Lloyd Kahn

References:

EPA "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY PROCEDURES MANUAL" US EPA EPA 520/5-84-006 AUGUST 1984

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0J060466

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L721C	001	CP-SED-COMP	10/01/10	14:50
L721W	002	PR-SED-COMP	10/01/10	13:25
L7211	003	RB100510A	10/05/10	15:00
L729K	004	SRM	10/05/10	

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

C0J060466

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Sediment Sampling
TA Quote#: 18005943
Project#: 1453417 0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Date	Time	Water	Sediment	Sample Identification	No. of Containers	Semivolatiles and PAHs SW846 8270C	Metals (ITM) ICP/MS 6020	Mercury 7471A	PCB Congeners 8082	Total Organic Carbon by Combustion (Lloyd Kahn)	Grain Size (Sieve and Hydrometer)	Hex Chromium (TA SOP) *Composite Samples Only*	PAHs SW846 8270SIM	Metals SW846 6020, SW846 7471A
10/1/10	1450		X	CP-SED-COMP / MS / MSD	2	X	X	X	X	X	X	X		
			~~X~~	~~CP-SED-COMP-MS~~	~~2~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~		
			~~X~~	~~CP-SED-COMP-MSD~~	~~2~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~		
10/1/10	1325		X	PR-SED-COMP	2	X	X	X	X	X	X	X		
10/5/10	1500	X		RB100510A	6		X		X				X	X

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN: ~~Carrie Gamber~~

Remarks

SEE PROJECT SPECIFIC ANALYTE LIST

Per phone discussion, Use CP-SED-COMP JAR SET FOR MS & MSD.

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Michael C. Ciarlo	10.5.10 1200		
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**
			10/6/10 10⁰⁰

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(1-131)

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060466

Client: Maryland Environmental Service, Millersville, MD Date: November 16, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CP-SED-COMP	C0J060466-001	Soil
1MS	CP-SED-COMPMS	C0J060466-001MS	Soil
1MSD	CP-SED-COMPMSD	C0J060466-001MSD	Soil
2	PR-SED-COMP	C0J060466-002	Soil
3	RB100510A	C0J060466-003	Water
4	SRM	C0J060466-004	Soil

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Blank ID	Compound	Conc. ug/L	Action Level ug/L	Qualifier	Affected Samples
MB- Water	Antimony	0.028	0.14	B	3
MB- Soil	Chromium	0.032 (mg/kg)	0.16 (mg/kg)	None	All > 5X

Field and Equipment Blank - Field QC results are summarized below.

Blank ID	Compound	Conc. ug/L	Action Level mg/kg	Qualifier	Affected Samples
RB100510A	Aluminum	4.0	2.0	None	All > 5X
	Arsenic	0.44	0.22	None	
	Chromium	4.8	2.4	None	
	Lead	0.092	0.046	None	
	Manganese	0.37	0.185	None	
	Thallium	0.13	0.065	B	2
	Tin	3.6	1.8	B	4
	Zinc	1.9	0.95	None	All > 5X

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
1	Antimony	39%/37%/OK	None	See ICP SD

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - The ICP serial dilution sample exhibited acceptable %D values except the following.

ICP Sample ID	Compound	%D	Qualifier	Affected Samples
1	Antimony	27.3%	J	1, 2, 4
	Tin	13.6%	J	

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

In EDS sample ID #1, iron was analyzed at a 4.1X dilution due to a high concentration.

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Client Sample ID: CP-SED-COMP

TOTAL Metals

Lot-Sample #...: C0J060466-001 Matrix.....: SOLID
Date Sampled...: 10/01/10 Date Received..: 10/06/10
% Moisture.....: 58

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0285367						
Aluminum	12200	2.9	mg/kg	SW846 6020	10/12-10/14/10	L721C1AD
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.28	
Antimony	1.4 ~~B~~ J	0.19	mg/kg	SW846 6020	10/12-10/14/10	L721C1AE
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0025	
Arsenic	51.8	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AF
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.017	
Beryllium	1.2	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AG
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0072	
Cadmium	5.0	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AH
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0068	
Chromium	259 ~~J~~	0.19	mg/kg	SW846 6020	10/12-10/14/10	L721C1AJ
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0059	
Cobalt	51.3	0.048	mg/kg	SW846 6020	10/12-10/14/10	L721C1AK
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0014	
Copper	376	0.19	mg/kg	SW846 6020	10/12-10/14/10	L721C1AL
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.032	
Iron	90200	48.3	mg/kg	SW846 6020	10/12-10/14/10	L721C1AM
		Dilution Factor: 4.1		Analysis Time..: 18:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 3.4	

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Client Sample ID: CP-SKD-COMP

TOTAL Metals

Lot-Sample #...: C0J060466-001 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	814	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AN
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0037	
Manganese	1360	0.048	mg/kg	SW846 6020	10/12-10/14/10	L721C1AP
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.010	
Nickel	39.6	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AQ
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.011	
Selenium	6.5	0.48	mg/kg	SW846 6020	10/12-10/14/10	L721C1AR
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.048	
Silver	2.2	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AT
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0038	
Thallium	0.82	0.097	mg/kg	SW846 6020	10/12-10/14/10	L721C1AU
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0019	
Tin	101 E J	0.48	mg/kg	SW846 6020	10/12-10/14/10	L721C1AV
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.057	
Zinc	1600	0.48	mg/kg	SW846 6020	10/12-10/14/10	L721C1AW
		Dilution Factor: 0.41		Analysis Time..: 17:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.063	

Prep Batch #...: 0301017

Mercury	1.6	0.039	mg/kg	SW846 7471A	10/28/10	L721C1A3
		Dilution Factor: 0.5		Analysis Time..: 08:24	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301009	MDL.....: 0.013	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

E Matrix interference.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: PR-SED-COMP

TOTAL Metals

Lot-Sample #...: C0J060466-002 **Matrix.....:** SOLID
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....: 20

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0285367						
Aluminum	**544**	**1.7**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AH**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.16	
Antimony	**0.072 ~~B~~ J**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AJ**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0015	
Arsenic	**1.3**	**0.056**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AK**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.010	
Beryllium	**0.063**	**0.056**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AL**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0042	
Cadmium	**0.047 ~~B~~ J**	**0.056**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AM**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0039	
Chromium	**19.2 ~~B~~**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AN**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0034	
Cobalt	**0.82**	**0.028**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AP**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.00084	
Copper	**4.0**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AQ**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.018	
Iron	**2190**	**2.8**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L721W1AR**
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.20	

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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

TOTAL Metals

Lot-Sample #...: C0J060466-002 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	5.9	0.056	mg/kg	SW846 6020	10/12-10/14/10	L721W1AT
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0021	
Manganese	69.2	0.028	mg/kg	SW846 6020	10/12-10/14/10	L721W1AU
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0058	
Nickel	1.6	0.056	mg/kg	SW846 6020	10/12-10/14/10	L721W1AV
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0063	
Selenium	0.14 ~~B~~ J	0.28	mg/kg	SW846 6020	10/12-10/14/10	L721W1AW
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.028	
Silver	0.033 ~~B~~ J	0.056	mg/kg	SW846 6020	10/12-10/14/10	L721W1AX
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0022	
Thallium	0.022 ~~B~~ B	0.056	mg/kg	SW846 6020	10/12-10/14/10	L721W1A0
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0011	
Tin	2.9 J	0.28	mg/kg	SW846 6020	10/12-10/14/10	L721W1A1
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.033	
Zinc	21.8	0.28	mg/kg	SW846 6020	10/12-10/14/10	L721W1A2
		Dilution Factor: 0.45		Analysis Time..: 18:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.036	

Prep Batch #...: 0301017

Mercury	0.014 ~~B~~ J	0.021	mg/kg	SW846 7471A	10/28/10	L721W1AE
		Dilution Factor: 0.5		Analysis Time..: 08:29	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301009	MDL.....: 0.0068	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: RB100510A

TOTAL Metals

Lot-Sample #...: C0J060466-003 **Matrix.....:** WATER
Date Sampled...: 10/05/10 **Date Received..:** 10/06/10

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0281105						
Mercury	ND	0.20	ug/L	SW846 7470A	10/08/10	L72111AW
		Dilution Factor: 1		Analysis Time..: 15:00	Analyst ID.....: 400491	
		Instrument ID..: HGHYDRA		MS Run #.....: 0281068	MDL.....: 0.038	
Prep Batch #...: 0285365						
Aluminum	**4.0 ~~B~~ J**	**30.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AC**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 2.6	
Antimony	**0.14 ~~B,U~~ B**	**2.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AD**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.019	
Arsenic	**0.44 ~~B~~ J**	**1.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AE**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.29	
Beryllium	ND	1.0	ug/L	SW846 6020	10/12-10/14/10	L72111AF
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.037	
Cadmium	ND	1.0	ug/L	SW846 6020	10/12-10/14/10	L72111AG
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.11	
Chromium	**4.8**	**2.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AH**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.54	
Cobalt	ND	0.50	ug/L	SW846 6020	10/12-10/14/10	L72111AJ
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.026	
Copper	ND	2.0	ug/L	SW846 6020	10/12-10/14/10	L72111AK
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.24	

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Client Sample ID: RB100510A

TOTAL Metals

Lot-Sample #...: C0J060466-003 **Matrix.....:** WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Iron	ND	50.0	ug/L	SW846 6020	10/12-10/14/10	L72111AL
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 6.1	
Lead	**0.092 ~~B~~ J**	**1.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AM**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.019	
Manganese	**0.37 ~~B~~ J**	**0.50**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AN**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.039	
Nickel	ND	1.0	ug/L	SW846 6020	10/12-10/14/10	L72111AP
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.17	
Selenium	ND	5.0	ug/L	SW846 6020	10/12-10/14/10	L72111AQ
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.42	
Silver	ND	1.0	ug/L	SW846 6020	10/12-10/14/10	L72111AR
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.036	
Thallium	**0.13 ~~B~~ J**	**1.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AT**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.015	
Tin	**3.6 ~~B~~ J**	**5.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AU**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 1.5	
Zinc	**1.9 ~~B~~ J**	**5.0**	**ug/L**	**SW846 6020**	**10/12-10/14/10**	**L72111AV**
		Dilution Factor: 1		Analysis Time..: 17:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....:	MDL.....: 0.96	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: SRM

TOTAL Metals

Lot-Sample #...: C0J060466-004 **Matrix.....:** SOLID
Date Sampled...: 10/05/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0285367						
Aluminum	**4400**	**1.6**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AC**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.16	
Antimony	**0.060 ~~B~~ J**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AD**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0014	
Arsenic	**4.2**	**0.055**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AE**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.010	
Beryllium	**0.27**	**0.055**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AF**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0041	
Cadmium	**0.19**	**0.055**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AG**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0038	
Chromium	**15.8 ~~J~~**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AH**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0034	
Cobalt	**2.7**	**0.028**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AJ**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.00082	
Copper	**8.1**	**0.11**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AK**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.018	
Iron	**12000**	**2.8**	**mg/kg**	**SW846 6020**	**10/12-10/14/10**	**L729K1AL**
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.19	

(Continued on next page)

MW
11/16/10

4

EA Engineering, Science and Technology

Client Sample ID: SRM

TOTAL Metals

Lot-Sample #...: C0J060466-004 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	7.4	0.055	mg/kg	SW846 6020	10/12-10/14/10	L729K1AM
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0021	
Manganese	83.5	0.028	mg/kg	SW846 6020	10/12-10/14/10	L729K1AN
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0057	
Nickel	15.0	0.055	mg/kg	SW846 6020	10/12-10/14/10	L729K1AP
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0062	
Selenium	0.34	0.28	mg/kg	SW846 6020	10/12-10/14/10	L729K1AQ
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.028	
Silver	0.040 ~~B~~ J	0.055	mg/kg	SW846 6020	10/12-10/14/10	L729K1AR
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0021	
Thallium	0.081	0.055	mg/kg	SW846 6020	10/12-10/14/10	L729K1AT
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.0011	
Tin	0.82 B	0.28	mg/kg	SW846 6020	10/12-10/14/10	L729K1AU
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.033	
Zinc	27.9	0.28	mg/kg	SW846 6020	10/12-10/14/10	L729K1AV
		Dilution Factor: 0.55		Analysis Time..: 18:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0285195	MDL.....: 0.036	
Prep Batch #...: 0301017						
Mercury	0.019	0.016	mg/kg	SW846 7471A	10/28/10	L729K1AX
		Dilution Factor: 0.5		Analysis Time..: 08:31	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301009	MDL.....: 0.0054	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW 11/16/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060466

Client: Maryland Environmental Service, Millersville, MD Date: November 16, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CP-SED-COMP	C0J060466-001	Soil
1MS	CP-SED-COMPMS	C0J060466-001MS	Soil
1MSD	CP-SED-COMPMSD	C0J060466-001MSD	Soil
2	PR-SED-COMP	C0J060466-002	Soil
3	RB100510A	C0J060466-003	Water
4	SRM	C0J060466-004	Soil

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - The continuing calibration exhibited acceptable %D values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
4	All	"0D"	None- diluted out

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
1	Many compounds	13 of 25 %R and 3 of 25 RPD outside QC limits	None- results not valid due to 4X dilution factor

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC results are summarized below.

Blank ID	Compound	Conc. ng/L	Action Level ug/kg	Qualifier	Affected Samples
RB100510A	PCB 44	0.43	0.188	B	2
	PCB 52	17	7.44	B	1, 2

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - Several compounds were flagged (PG) by the laboratory indicating that the percent difference (% D) between the original and confirmation analyses is greater than 40%. The reviewer flagged these and all results with >25% D as estimated (J).

EDS sample ID#s 1 and 4 were analyzed at a dilution due to the high concentrations of congeners detected.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC Semivolatiles

Lot-Sample #...:	C0J060466-001	Work Order #...:	L721C1A2	Matrix.....:	SOLID
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0280035
Prep Date.....:	10/07/10	Analysis Date..:	10/08/10		
Prep Batch #...:	0280061	Analysis Time..:	21:10		
Dilution Factor:	4	Initial Wgt/Vol:	12 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	58	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	19 ~~PG~~ J	1.6	ug/kg	0.33
PCB 18 (BZ)	20	1.6	ug/kg	0.22
PCB 28 (BZ)	26	1.6	ug/kg	0.35
PCB 44 (BZ)	21	1.6	ug/kg	0.32
PCB 49 (BZ)	10 ~~PG~~ J	1.6	ug/kg	0.33
PCB 52 (BZ)	26 B	1.6	ug/kg	0.31
PCB 66 (BZ)	ND	1.6	ug/kg	0.26
PCB 77 (BZ)	ND	1.6	ug/kg	0.34
PCB 87 (BZ)	10 ~~PG~~ J	1.6	ug/kg	0.29
PCB 90 (BZ)	2.9 PG J	1.6	ug/kg	0.24
PCB 101 (BZ)	ND	1.6	ug/kg	0.32
PCB 105 (BZ)	4.8 ~~PG~~ J	1.6	ug/kg	0.33
PCB 118 (BZ)	14	1.6	ug/kg	0.32
PCB 126 (BZ)	ND	1.6	ug/kg	0.41
PCB 128 (BZ)	8.0 J	1.6	ug/kg	0.32
PCB 138 (BZ)	15 ~~PG~~ J	1.6	ug/kg	0.34
PCB 153 (BZ)	21 J	1.6	ug/kg	0.33
PCB 156 (BZ)	ND	1.6	ug/kg	0.32
PCB 169 (BZ)	ND	1.6	ug/kg	0.31
PCB 170 (BZ)	6.6 ~~PG~~ J	1.6	ug/kg	0.32
PCB 180 (BZ)	ND	1.6	ug/kg	0.32
PCB 183 (BZ)	0.43 ~~J, PG~~ J	1.6	ug/kg	0.31
PCB 184 (BZ)	ND	1.6	ug/kg	0.27
PCB 187 (BZ)	7.2	1.6	ug/kg	0.33
PCB 195 (BZ)	3.3 ~~PG~~ J	1.6	ug/kg	0.32
PCB 206 (BZ)	8.0 ~~PG~~	1.6	ug/kg	0.32
PCB 209 (BZ)	8.4 ~~PG~~	1.6	ug/kg	0.34

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	66	(35 - 140)
PCB 205 (BZ)	79	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

11/16/10

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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC Semivolatiles

Lot-Sample #...:	C0J060466-002	Work Order #...:	L721W1AD	Matrix.....:	SOLID
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0280035
Prep Date.....:	10/07/10	Analysis Date..:	10/07/10		
Prep Batch #...:	0280061	Analysis Time..:	18:43		
Dilution Factor:	0.98	Initial Wgt/Vol:	12.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	20	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	0.47 ~~PG~~ J	0.21	ug/kg	0.042
PCB 18 (BZ)	ND	0.21	ug/kg	0.028
PCB 28 (BZ)	0.32	0.21	ug/kg	0.046
PCB 44 (BZ)	0.16 ~~J~~ B	0.21	ug/kg	0.042
PCB 49 (BZ)	0.25 J	0.21	ug/kg	0.043
PCB 52 (BZ)	0.31 B	0.21	ug/kg	0.041
PCB 66 (BZ)	ND	0.21	ug/kg	0.033
PCB 77 (BZ)	ND	0.21	ug/kg	0.045
PCB 87 (BZ)	0.18 ~~J,PG~~ J	0.21	ug/kg	0.038
PCB 90 (BZ)	ND	0.21	ug/kg	0.031
PCB 101 (BZ)	0.22	0.21	ug/kg	0.041
PCB 105 (BZ)	0.15 ~~J~~ J	0.21	ug/kg	0.043
PCB 118 (BZ)	0.14 ~~J,PG~~ J	0.21	ug/kg	0.042
PCB 126 (BZ)	ND	0.21	ug/kg	0.054
PCB 128 (BZ)	0.057 ~~J,PG~~ J	0.21	ug/kg	0.042
PCB 138 (BZ)	0.33	0.21	ug/kg	0.044
PCB 153 (BZ)	0.24	0.21	ug/kg	0.042
PCB 156 (BZ)	ND	0.21	ug/kg	0.041
PCB 169 (BZ)	ND	0.21	ug/kg	0.040
PCB 170 (BZ)	ND	0.21	ug/kg	0.042
PCB 180 (BZ)	ND	0.21	ug/kg	0.042
PCB 183 (BZ)	ND	0.21	ug/kg	0.041
PCB 184 (BZ)	ND	0.21	ug/kg	0.035
PCB 187 (BZ)	ND	0.21	ug/kg	0.043
PCB 195 (BZ)	ND	0.21	ug/kg	0.041
PCB 206 (BZ)	ND	0.21	ug/kg	0.041
PCB 209 (BZ)	0.16 ~~J,PG~~ J	0.21	ug/kg	0.044

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	39	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

NW 11/16/10

3

KA Engineering, Science and Technology

Client Sample ID: RB100510A

GC Semivolatiles

Lot-Sample #...:	C0J060466-003	**Work Order #...:**	L72111AA	**Matrix.....:**	WATER
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	
Prep Date.....:	10/07/10	**Analysis Date..:**	10/08/10		
Prep Batch #...:	0280293	**Analysis Time..:**	22:25		
Dilution Factor:	0.95	**Initial Wgt/Vol:**	1050 mL	**Final Wgt/Vol..:**	2 mL
Analyst ID.....:	001797	**Instrument ID..:**	W/X		
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	0.95	ng/L	0.42
PCB 18 (BZ)	ND	0.95	ng/L	0.46
PCB 28 (BZ)	ND	0.95	ng/L	0.41
PCB 44 (BZ)	**0.43 ~~J,PG~~ J**	**0.95**	**ng/L**	**0.41**
PCB 49 (BZ)	ND	0.95	ng/L	0.43
PCB 52 (BZ)	**17**	**0.95**	**ng/L**	**0.41**
PCB 66 (BZ)	ND	0.95	ng/L	0.48
PCB 77 (BZ)	ND	0.95	ng/L	0.42
PCB 87 (BZ)	ND	0.95	ng/L	0.39
PCB 90 (BZ)	ND	0.95	ng/L	0.74
PCB 101 (BZ)	ND	0.95	ng/L	0.39
PCB 105 (BZ)	ND	0.95	ng/L	0.36
PCB 118 (BZ)	ND	0.95	ng/L	0.51
PCB 126 (BZ)	ND	0.95	ng/L	0.37
PCB 128 (BZ)	ND	0.95	ng/L	0.34
PCB 138 (BZ)	ND	0.95	ng/L	0.32
PCB 153 (BZ)	ND	0.95	ng/L	0.37
PCB 156 (BZ)	ND	0.95	ng/L	0.36
PCB 169 (BZ)	ND	0.95	ng/L	0.41
PCB 170 (BZ)	ND	0.95	ng/L	0.35
PCB 180 (BZ)	ND	0.95	ng/L	0.35
PCB 183 (BZ)	ND	0.95	ng/L	0.35
PCB 184 (BZ)	ND	0.95	ng/L	0.40
PCB 187 (BZ)	ND	0.95	ng/L	0.37
PCB 195 (BZ)	ND	0.95	ng/L	0.37
PCB 206 (BZ)	ND	0.95	ng/L	0.36
PCB 209 (BZ)	ND	0.95	ng/L	0.42

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	61	(35 - 140)
PCB 205 (BZ)	49	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
11/16/10

4

EA Engineering, Science and Technology

Client Sample ID: SRM

GC Semivolatiles

Lot-Sample #...:	C0J060466-004	**Work Order #...:**	L729K1AW	**Matrix.....:**	SOLID
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0280035
Prep Date.....:	10/07/10	**Analysis Date..:**	10/07/10		
Prep Batch #...:	0280061	**Analysis Time..:**	19:08		
Dilution Factor:	120	Initial Wgt/Vol:	10 g	Final Wgt/Vol..:	4 mL
% Moisture.....:		Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	**3700**	**20**	**ug/kg**	**4.2**
PCB 18 (BZ)	**5800**	**20**	**ug/kg**	**2.8**
PCB 28 (BZ)	ND	20	ug/kg	4.5
PCB 44 (BZ)	**1200**	**20**	**ug/kg**	**4.1**
PCB 49 (BZ)	**1900 ~~PG~~ J**	**20**	**ug/kg**	**4.2**
PCB 52 (BZ)	**2000 ~~PG~~ J**	**20**	**ug/kg**	**4.0**
PCB 66 (BZ)	ND	20	ug/kg	3.3
PCB 77 (BZ)	ND	20	ug/kg	4.4
PCB 87 (BZ)	**240 J**	**20**	**ug/kg**	**3.7**
PCB 90 (BZ)	**170 ~~PG~~ J**	**20**	**ug/kg**	**3.1**
PCB 101 (BZ)	**430 J**	**20**	**ug/kg**	**4.0**
PCB 105 (BZ)	**220**	**20**	**ug/kg**	**4.2**
PCB 118 (BZ)	**230 ~~PG~~ J**	**20**	**ug/kg**	**4.1**
PCB 126 (BZ)	ND	20	ug/kg	5.3
PCB 128 (BZ)	**150**	**20**	**ug/kg**	**4.1**
PCB 138 (BZ)	**250 J**	**20**	**ug/kg**	**4.3**
PCB 153 (BZ)	**310**	**20**	**ug/kg**	**4.2**
PCB 156 (BZ)	**70 ~~PG~~ J**	**20**	**ug/kg**	**4.1**
PCB 169 (BZ)	ND	20	ug/kg	4.0
PCB 170 (BZ)	**140 J**	**20**	**ug/kg**	**4.1**
PCB 180 (BZ)	**100**	**20**	**ug/kg**	**4.1**
PCB 183 (BZ)	**34 ~~PG~~ J**	**20**	**ug/kg**	**4.0**
PCB 184 (BZ)	ND	20	ug/kg	3.5
PCB 187 (BZ)	**170 J**	**20**	**ug/kg**	**4.2**
PCB 195 (BZ)	**22**	**20**	**ug/kg**	**4.1**
PCB 206 (BZ)	**50 J**	**20**	**ug/kg**	**4.0**
PCB 209 (BZ)	**13 J**	**20**	**ug/kg**	**4.3**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	NC,DIL	(35 - 140)
PCB 205 (BZ)	NC,DIL	(35 - 140)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW 11/16/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS
USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060466

Client: Maryland Environmental Service, Millersville, MD Date: November 16, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CP-SED-COMP	C0J060466-001	Soil
1MS	CP-SED-COMPMS	C0J060466-001MS	Soil
1MSD	CP-SED-COMPMSD	C0J060466-001MSD	Soil
1DL	CP-SED-COMPDL	C0J060466-001DL	Soil
2	PR-SED-COMP	C0J060466-002	Soil
3	RB100510A	C0J060466-003	Water
3RE	RB100510ARE	C0J060466-003RE	Water
4	SRM	C0J060466-004	Soil

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 7 days for water samples, 14 days for soil samples and analyzed within 40 days for all samples except the following.

Sample	Date Sampled	Date Extracted	# of Days	Qualifier
3RE	10/05/10	10/14/10	9	J/UJ

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
1	All surrogates	"0D"	None- diluted out
1DL	All surrogates	"0D"	None- diluted out
3	S6= 2,4,6-Tribromophenol	4.4%	J/R- All acid compounds

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
1	All compounds	"0D"	None- diluted out

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria.

Method Blank - The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ug/L	Action Level ug/L	Qualifier	Affected Samples
L77TR1AA	Butylbenzylphthalate	0.15	1.5	None	All ND
	Acenaphthene	0.025	0.125	B	3
	Phenanthrene	0.16	0.80	B	3

Field, Equipment Blank - Field QC results are summarized below.

Blank ID	Compound	Conc. ug/L	Action Level ug/kg	Qualifier	Affected Samples
RB100510A	Fluoranthene	0.015	2.5	None	All > 5X

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - EDS sample ID # 1 exhibited a high concentration of the compound naphthalene and was flagged (E) by the laboratory. The sample was diluted and reanalyzed, and the dilution result for naphthalene should be used for reporting purposes.

EDS sample ID #3 (RB100510A- rinsate blank RE) exhibited high concentrations of several target compounds and appears to have been contaminated. The original results should be used for reporting purposes even though the acid results have been rejected.

The compounds benzo(b)fluoranthene and benzo(k)fluoranthene could not be separated. Therefore, the results were reported as benzo(b)fluoranthene and were non-detect for benzo(k)fluoranthene. The reviewer has qualified these results estimated (J/UJ) in all soil samples.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-001	**Work Order #...:**	L721C1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 14:50	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0280052	**Analysis Time..:**	14:26		
Dilution Factor:	24.8	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	58	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	39000	ug/kg	8200
1,2-Dichlorobenzene	ND	1900	ug/kg	200
1,3-Dichlorobenzene	ND	1900	ug/kg	150
1,4-Dichlorobenzene	ND	1900	ug/kg	140
Benzoic acid	ND	9900	ug/kg	810
Benzyl alcohol	ND	1900	ug/kg	240
bis(2-Chloroethyl)-ether	ND	390	ug/kg	52
bis(2-Chloroethoxy) methane	ND	1900	ug/kg	130
bis(2-Ethylhexyl) phthalate	**1200 J**	**3900**	**ug/kg**	**320**
4-Bromophenyl phenyl ether	ND	1900	ug/kg	170
Butyl benzyl phthalate	ND	1900	ug/kg	270
4-Chloro-3-methylphenol	ND	1900	ug/kg	180
2-Chloronaphthalene	ND	390	ug/kg	41
2-Chlorophenol	ND	1900	ug/kg	160
4-Chlorophenyl phenyl ether	ND	1900	ug/kg	220
Dibenzofuran	**2800**	**1900**	**ug/kg**	**190**
Di-n-butyl phthalate	ND	1900	ug/kg	240
3,3'-Dichlorobenzidine	ND	1900	ug/kg	210
2,4-Dichlorophenol	ND	390	ug/kg	39
Diethyl phthalate	ND	1900	ug/kg	210
4,6-Dinitro-2-methylphenol	ND	9900	ug/kg	780
2,4-Dimethylphenol	ND	1900	ug/kg	300
Dimethyl phthalate	ND	1900	ug/kg	210
2,4-Dinitrophenol	ND	9900	ug/kg	2300
2,4-Dinitrotoluene	ND	1900	ug/kg	160
2,6-Dinitrotoluene	ND	1900	ug/kg	200
1,2-Diphenylhydrazine	ND	1900	ug/kg	250
Di-n-octyl phthalate	ND	1900	ug/kg	210
Hexachlorobenzene	ND	390	ug/kg	42
Hexachlorobutadiene	ND	390	ug/kg	44
Hexachloroethane	ND	1900	ug/kg	140

(Continued on next page)

LW 11/16/10

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C1AC Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	1900	ug/kg	210
Isophorone	ND	1900	ug/kg	150
2-Methylphenol	ND	1900	ug/kg	140
4-Methylphenol	**230 J**	**1900**	**ug/kg**	**190**
Nitrobenzene	ND	3900	ug/kg	160
2-Nitrophenol	ND	1900	ug/kg	210
4-Nitrophenol	ND	9900	ug/kg	660
N-Nitrosodiphenylamine	ND	1900	ug/kg	180
N-Nitrosodimethylamine	ND	1900	ug/kg	170
N-Nitrosodi-n-propylamine	ND	390	ug/kg	46
2,2'-oxybis (1-Chloropropane)	ND	390	ug/kg	42
Pentachlorophenol	ND	1900	ug/kg	170
Phenol	ND	390	ug/kg	46
1,2,4-Trichlorobenzene	ND	1900	ug/kg	110
2,4,6-Trichlorophenol	ND	1900	ug/kg	290
2-Methylnaphthalene	**2800**	**390**	**ug/kg**	**35**
1-Methylnaphthalene	**1400**	**390**	**ug/kg**	**42**
Naphthalene	83000 ~~**87000 B**~~	180 ~~**390**~~	**ug/kg**	67 ~~**34**~~
Acenaphthylene	**5600**	**390**	**ug/kg**	**45**
Acenaphthene	**2800**	**390**	**ug/kg**	**37**
Fluorene	**2900**	**390**	**ug/kg**	**51**
Phenanthrene	**15000**	**390**	**ug/kg**	**62**
Anthracene	**12000**	**390**	**ug/kg**	**38**
Fluoranthene	**59000**	**390**	**ug/kg**	**42**
Pyrene	**31000**	**390**	**ug/kg**	**39**
Benzo(a)anthracene	**27000**	**390**	**ug/kg**	**49**
Chrysene	**26000**	**390**	**ug/kg**	**46**
Benzo(b)fluoranthene	**35000** J	**390**	**ug/kg**	**61**
Benzo(k)fluoranthene	~~ND~~ UJ	390	ug/kg	79
Benzo(a)pyrene	**29000**	**390**	**ug/kg**	**39**
Indeno(1,2,3-cd)pyrene	**14000**	**390**	**ug/kg**	**40**
Dibenzo(a,h)anthracene	**4900**	**390**	**ug/kg**	**43**
Benzo(ghi)perylene	**15000**	**390**	**ug/kg**	**39**

(Continued on next page)

MW
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EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C1AC Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

E Estimated result. Result concentration exceeds the calibration range.

NW
11/16/10

IDL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-001	**Work Order #...:**	L721C2AC	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 14:50	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/12/10		
Prep Batch #...:	0280052	**Analysis Time..:**	04:45		
Dilution Factor:	49.66	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	58	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

Use original results

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	78000	ug/kg	16000
1,2-Dichlorobenzene	ND	3900	ug/kg	410
1,3-Dichlorobenzene	ND	3900	ug/kg	300
1,4-Dichlorobenzene	ND	3900	ug/kg	280
Benzoic acid	ND	20000	ug/kg	1600
Benzyl alcohol	ND	3900	ug/kg	470
bis(2-Chloroethyl)-ether	ND	780	ug/kg	100
bis(2-Chloroethoxy) methane	ND	3900	ug/kg	260
bis(2-Ethylhexyl) phthalate	**1100 J**	**7800**	**ug/kg**	**630**
4-Bromophenyl phenyl ether	ND	3900	ug/kg	340
Butyl benzyl phthalate	ND	3900	ug/kg	530
4-Chloro-3-methylphenol	ND	3900	ug/kg	360
2-Chloronaphthalene	ND	780	ug/kg	81
2-Chlorophenol	ND	3900	ug/kg	320
4-Chlorophenyl phenyl ether	ND	3900	ug/kg	430
Dibenzofuran	**2400 J**	**3900**	**ug/kg**	**380**
Di-n-butyl phthalate	ND	3900	ug/kg	490
3,3'-Dichlorobenzidine	ND	3900	ug/kg	410
2,4-Dichlorophenol	ND	780	ug/kg	78
Diethyl phthalate	ND	3900	ug/kg	430
4,6-Dinitro-2-methylphenol	ND	20000	ug/kg	1600
2,4-Dimethylphenol	ND	3900	ug/kg	610
Dimethyl phthalate	ND	3900	ug/kg	430
2,4-Dinitrophenol	ND	20000	ug/kg	4600
2,4-Dinitrotoluene	ND	3900	ug/kg	320
2,6-Dinitrotoluene	ND	3900	ug/kg	400
1,2-Diphenylhydrazine	ND	3900	ug/kg	500
Di-n-octyl phthalate	ND	3900	ug/kg	410
Hexachlorobenzene	ND	780	ug/kg	83
Hexachlorobutadiene	ND	780	ug/kg	87
Hexachloroethane	ND	3900	ug/kg	280

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hw
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1DL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C2AC Matrix.....: SOLID

use original results

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	3900	ug/kg	420
Isophorone	ND	3900	ug/kg	290
2-Methylphenol	ND	3900	ug/kg	270
4-Methylphenol	ND	3900	ug/kg	380
Nitrobenzene	ND	7800	ug/kg	320
2-Nitrophenol	ND	3900	ug/kg	430
4-Nitrophenol	ND	20000	ug/kg	1300
N-Nitrosodiphenylamine	ND	3900	ug/kg	360
N-Nitrosodimethylamine	ND	3900	ug/kg	330
N-Nitrosodi-n-propylamine	ND	780	ug/kg	92
2,2'-oxybis (1-Chloropropane)	ND	780	ug/kg	84
Pentachlorophenol	ND	3900	ug/kg	350
Phenol	ND	780	ug/kg	92
1,2,4-Trichlorobenzene	ND	3900	ug/kg	220
2,4,6-Trichlorophenol	ND	3900	ug/kg	580
2-Methylnaphthalene	2500	780	ug/kg	70
1-Methylnaphthalene	1200	780	ug/kg	83
Naphthalene	83000	780	ug/kg	67
Acenaphthylene	3800	780	ug/kg	89
Acenaphthene	2400	780	ug/kg	75
Fluorene	2400	780	ug/kg	100
Phenanthrene	12000	780	ug/kg	120
Anthracene	10000	780	ug/kg	76
Fluoranthene	46000	780	ug/kg	83
Pyrene	29000	780	ug/kg	79
Benzo(a)anthracene	23000	780	ug/kg	98
Chrysene	22000	780	ug/kg	93
Benzo(b)fluoranthene	30000 J	780	ug/kg	120
Benzo(k)fluoranthene	~~ND~~ UJ	780	ug/kg	160
Benzo(a)pyrene	24000	780	ug/kg	78
Indeno(1,2,3-cd)pyrene	11000	780	ug/kg	80
Dibenzo(a,h)anthracene	4000	780	ug/kg	87
Benzo(ghi)perylene	12000	780	ug/kg	78

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1DL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 **Work Order #...:** L721C2AC **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

Use original results

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

NW
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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-002	**Work Order #...:**	L721W1AG	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 13:25	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0280052	**Analysis Time..:**	15:26		
Dilution Factor:	2.49	**Initial Wgt/Vol:**	30.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	20	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
1,4-Dichlorobenzene	ND	100	ug/kg	7.4
Benzidine	ND	2100	ug/kg	430
1,2-Dichlorobenzene	ND	100	ug/kg	11
1,3-Dichlorobenzene	ND	100	ug/kg	8.0
Benzoic acid	ND	530	ug/kg	43
Benzyl alcohol	ND	100	ug/kg	12
bis(2-Chloroethyl)-ether	ND	21	ug/kg	2.8
bis(2-Chloroethoxy) methane	ND	100	ug/kg	6.8
bis(2-Ethylhexyl) phthalate	ND	210	ug/kg	17
4-Bromophenyl phenyl ether	ND	100	ug/kg	9.0
Butyl benzyl phthalate	ND	100	ug/kg	14
4-Chloro-3-methylphenol	ND	100	ug/kg	9.5
2-Chloronaphthalene	ND	21	ug/kg	2.2
2-Chlorophenol	ND	100	ug/kg	8.4
4-Chlorophenyl phenyl ether	ND	100	ug/kg	11
Dibenzofuran	ND	100	ug/kg	10
Di-n-butyl phthalate	ND	100	ug/kg	13
3,3'-Dichlorobenzidine	ND	100	ug/kg	11
2,4-Dichlorophenol	ND	21	ug/kg	2.1
Diethyl phthalate	ND	100	ug/kg	11
4,6-Dinitro-2-methylphenol	ND	530	ug/kg	42
2,4-Dimethylphenol	ND	100	ug/kg	16
Dimethyl phthalate	ND	100	ug/kg	11
2,4-Dinitrophenol	ND	530	ug/kg	120
2,4-Dinitrotoluene	ND	100	ug/kg	8.3
2,6-Dinitrotoluene	ND	100	ug/kg	11
1,2-Diphenylhydrazine	ND	100	ug/kg	13
Di-n-octyl phthalate	ND	100	ug/kg	11
Hexachlorobenzene	ND	21	ug/kg	2.2
Hexachlorobutadiene	ND	21	ug/kg	2.3
Hexachloroethane	ND	100	ug/kg	7.4

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NW
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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-002 Work Order #...: L721W1AG Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	100	ug/kg	11
Isophorone	ND	100	ug/kg	7.8
2-Methylphenol	ND	100	ug/kg	7.2
4-Methylphenol	ND	100	ug/kg	10
Nitrobenzene	ND	210	ug/kg	8.6
2-Nitrophenol	ND	100	ug/kg	11
4-Nitrophenol	ND	530	ug/kg	35
N-Nitrosodiphenylamine	ND	100	ug/kg	9.6
N-Nitrosodimethylamine	ND	100	ug/kg	8.9
N-Nitrosodi-n-propylamine	ND	21	ug/kg	2.4
2,2'-oxybis (1-Chloropropane)	ND	21	ug/kg	2.2
Pentachlorophenol	ND	100	ug/kg	9.2
Phenol	ND	21	ug/kg	2.4
1,2,4-Trichlorobenzene	ND	100	ug/kg	5.7
2,4,6-Trichlorophenol	ND	100	ug/kg	15
2-Methylnaphthalene	ND	21	ug/kg	1.9
1-Methylnaphthalene	ND	21	ug/kg	2.2
Naphthalene	**21**	**21**	**ug/kg**	**1.8**
Acenaphthylene	**10 J**	**21**	**ug/kg**	**2.4**
Acenaphthene	ND	21	ug/kg	2.0
Fluorene	ND	21	ug/kg	2.7
Phenanthrene	**12 J**	**21**	**ug/kg**	**3.3**
Anthracene	**8.2 J**	**21**	**ug/kg**	**2.0**
Fluoranthene	**23**	**21**	**ug/kg**	**2.2**
Pyrene	**16 J**	**21**	**ug/kg**	**2.1**
Benzo(a)anthracene	**12 J**	**21**	**ug/kg**	**2.6**
Chrysene	**10 J**	**21**	**ug/kg**	**2.5**
Benzo(b)fluoranthene	**16 ~~J~~ J**	**21**	**ug/kg**	**3.2**
Benzo(k)fluoranthene	~~ND~~ U J	21	ug/kg	4.2
Benzo(a)pyrene	**12 J**	**21**	**ug/kg**	**2.1**
Indeno(1,2,3-cd)pyrene	ND	21	ug/kg	2.1
Dibenzo(a,h)anthracene	ND	21	ug/kg	2.3
Benzo(ghi)perylene	ND	21	ug/kg	2.1

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lw
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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-002 Work Order #...: L721W1AG Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	46	(27 - 110)
Terphenyl-d14	45	(21 - 130)
2-Fluorobiphenyl	49	(28 - 108)
2-Fluorophenol	49	(28 - 107)
Phenol-d5	45	(30 - 112)
2,4,6-Tribromophenol	38	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

CW 11/16/10

3

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-003	**Work Order #...:**	L72111AX	**Matrix.....:**	WATER
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	
Prep Date.....:	10/08/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0282028	**Analysis Time..:**	21:37		
Dilution Factor:	0.95	**Initial Wgt/Vol:**	1050 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	430261	**Instrument ID..:**	732		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	19	ug/L	3.3
1,2-Dichlorobenzene	ND	0.95	ug/L	0.071
1,3-Dichlorobenzene	ND	0.95	ug/L	0.071
1,4-Dichlorobenzene	ND	0.95	ug/L	0.071
Benzoic acid	~~ND~~ R	4.8	ug/L	0.53
Benzyl alcohol	~~ND~~ R	0.95	ug/L	0.20
bis(2-Chloroethyl)-ether	ND	0.19	ug/L	0.024
bis(2-Chloroethoxy) methane	ND	0.95	ug/L	0.055
bis(2-Ethylhexyl) phthalate	ND	1.9	ug/L	0.76
4-Bromophenyl phenyl ether	ND	0.95	ug/L	0.060
Butyl benzyl phthalate	ND	0.95	ug/L	0.14
4-Chloro-3-methylphenol	~~ND~~ R	0.95	ug/L	0.072
2-Chloronaphthalene	ND	0.19	ug/L	0.014
2-Chlorophenol	~~ND~~ R	0.95	ug/L	0.16
4-Chlorophenyl phenyl ether	ND	0.95	ug/L	0.048
Dibenzofuran	ND	0.95	ug/L	0.059
Di-n-butyl phthalate	ND	0.95	ug/L	0.12
3,3'-Dichlorobenzidine	ND	0.95	ug/L	0.11
2,4-Dichlorophenol	~~ND~~ R	0.19	ug/L	0.032
Diethyl phthalate	ND	0.95	ug/L	0.14
4,6-Dinitro-2-methylphenol	~~ND~~ R	4.8	ug/L	0.21
2,4-Dimethylphenol	~~ND~~ R	0.95	ug/L	0.081
Dimethyl phthalate	ND	0.95	ug/L	0.073
2,4-Dinitrophenol	~~ND~~ R	4.8	ug/L	0.58
2,4-Dinitrotoluene	ND	0.95	ug/L	0.051
2,6-Dinitrotoluene	ND	0.95	ug/L	0.076
1,2-Diphenylhydrazine	ND	0.95	ug/L	0.063
Di-n-octyl phthalate	ND	0.95	ug/L	0.20
Hexachlorobenzene	ND	0.19	ug/L	0.017
Hexachlorobutadiene	ND	0.19	ug/L	0.016
Hexachloroethane	ND	0.95	ug/L	0.060

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EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 **Work Order #...:** L72111AX **Matrix.....:** WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	0.95	ug/L	0.049
Isophorone	ND	0.95	ug/L	0.061
2-Methylphenol	~~ND~~ R	0.95	ug/L	0.082
4-Methylphenol	~~ND~~ R	0.95	ug/L	0.086
Nitrobenzene	ND	1.9	ug/L	0.080
2-Nitrophenol	~~ND~~ R	0.95	ug/L	0.16
4-Nitrophenol	~~ND~~ R	4.8	ug/L	0.57
N-Nitrosodiphenylamine	ND	0.95	ug/L	0.081
N-Nitrosodimethylamine	ND	0.95	ug/L	0.070
N-Nitrosodi-n-propylamine	ND	0.19	ug/L	0.029
2,2'-oxybis (1-Chloropropane)	ND	0.19	ug/L	0.019
Pentachlorophenol	~~ND~~ R	0.95	ug/L	0.063
Phenol	~~ND~~ R	0.19	ug/L	0.055
1,2,4-Trichlorobenzene	ND	0.95	ug/L	0.068
2,4,6-Trichlorophenol	~~ND~~ R	0.95	ug/L	0.17
2-Methylnaphthalene	ND	0.19	ug/L	0.012
1-Methylnaphthalene	ND	0.19	ug/L	0.013
Naphthalene	ND	0.19	ug/L	0.013
Acenaphthylene	ND	0.19	ug/L	0.014
Acenaphthene	**0.024 ~~J,B~~ B**	**0.19**	**ug/L**	**0.014**
Fluorene	ND	0.19	ug/L	0.021
Phenanthrene	**0.15 ~~J,B~~ B**	**0.19**	**ug/L**	**0.041**
Anthracene	ND	0.19	ug/L	0.015
Fluoranthene	**0.015 J**	**0.19**	**ug/L**	**0.015**
Pyrene	ND	0.19	ug/L	0.015
Benzo(a)anthracene	ND	0.19	ug/L	0.014
Chrysene	ND	0.19	ug/L	0.013
Benzo(b)fluoranthene	ND	0.19	ug/L	0.015
Benzo(k)fluoranthene	ND	0.19	ug/L	0.052
Benzo(a)pyrene	ND	0.19	ug/L	0.013
Indeno(1,2,3-cd)pyrene	ND	0.19	ug/L	0.019
Dibenzo(a,h)anthracene	ND	0.19	ug/L	0.015
Benzo(ghi)perylene	ND	0.19	ug/L	0.014

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EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 Work Order #...: L72111AX Matrix.....: WATER

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(23 - 112)
Terphenyl-d14	65	(10 - 132)
2-Fluorobiphenyl	62	(19 - 107)
2-Fluorophenol	52	(10 - 111)
Phenol-d5	69	(15 - 112)
2,4,6-Tribromophenol	4.4 *	(16 - 122)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW
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3RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

use original results

Lot-Sample #...:	C0J060466-003	**Work Order #...:**	L72114AX	**Matrix.....:**	WATER
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	
Prep Date.....:	10/14/10	**Analysis Date..:**	10/18/10		
Prep Batch #...:	0287214	**Analysis Time..:**	13:06		
Dilution Factor:	0.94	**Initial Wgt/Vol:**	1060 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	733		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	~~ND~~ UJ	0.19	ug/L	0.014
Acenaphthylene	~~ND~~	0.19	ug/L	0.014
Anthracene	~~ND~~	0.19	ug/L	0.014
Benzidine	~~ND~~	19	ug/L	3.3
Benzo(a)anthracene	**0.26** J	**0.19**	**ug/L**	**0.014**
Benzo(b)fluoranthene	**0.45**	**0.19**	**ug/L**	**0.015**
Benzo(k)fluoranthene	**0.51**	**0.19**	**ug/L**	**0.051**
Benzoic acid	~~ND~~ UJ	4.7	ug/L	0.53
Benzo(ghi)perylene	**0.45** J	**0.19**	**ug/L**	**0.014**
Benzo(a)pyrene	**0.30** J	**0.19**	**ug/L**	**0.013**
Benzyl alcohol	~~ND~~ UJ	0.94	ug/L	0.20
bis(2-Chloroethoxy) methane	~~ND~~	0.94	ug/L	0.055
bis(2-Chloroethyl)-ether	~~ND~~	0.19	ug/L	0.024
bis(2-Ethylhexyl) phthalate	**0.81** ~~J~~ J	**1.9**	**ug/L**	**0.75**
4-Bromophenyl phenyl ether	~~ND~~ UJ	0.94	ug/L	0.060
Butyl benzyl phthalate	~~ND~~	0.94	ug/L	0.13
4-Chloro-3-methylphenol	~~ND~~	0.94	ug/L	0.071
2-Chloronaphthalene	~~ND~~	0.19	ug/L	0.014
2-Chlorophenol	~~ND~~	0.94	ug/L	0.16
4-Chlorophenyl phenyl ether	~~ND~~	0.94	ug/L	0.047
Chrysene	**0.40** J	**0.19**	**ug/L**	**0.013**
Dibenzofuran	~~ND~~ UJ	0.94	ug/L	0.058
Di-n-butyl phthalate	~~ND~~	0.94	ug/L	0.12
1,2-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
1,3-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
1,4-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
3,3'-Dichlorobenzidine	~~ND~~	0.94	ug/L	0.11
2,4-Dichlorophenol	~~ND~~	0.19	ug/L	0.031
Diethyl phthalate	~~ND~~	0.94	ug/L	0.14
2,4-Dimethylphenol	~~ND~~	0.94	ug/L	0.080
Dimethyl phthalate	~~ND~~	0.94	ug/L	0.072
Di-n-octyl phthalate	**0.48** ~~J~~ J	**0.94**	**ug/L**	**0.19**

(Continued on next page)

NW
11/16/10

3 RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

use original results

Lot-Sample #...: C0J060466-003 Work Order #...: L72114AX Matrix.....: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
4,6-Dinitro-2-methylphenol	ND UJ	4.7	ug/L	0.21
2,4-Dinitrophenol	ND	4.7	ug/L	0.58
2,4-Dinitrotoluene	ND	0.94	ug/L	0.050
2,6-Dinitrotoluene	ND	0.94	ug/L	0.075
1,2-Diphenylhydrazine	ND	0.94	ug/L	0.062
Fluoranthene	**0.024 ~~J~~ J**	**0.19**	**ug/L**	**0.015**
Fluorene	**0.023 ~~J~~ J**	**0.19**	**ug/L**	**0.020**
Hexachlorobenzene	ND UJ	0.19	ug/L	0.017
Hexachlorobutadiene	ND	0.19	ug/L	0.016
Hexachlorocyclopentadiene	ND	0.94	ug/L	0.049
Hexachloroethane	ND	0.94	ug/L	0.059
Indeno(1,2,3-cd)pyrene	**0.52 J**	**0.19**	**ug/L**	**0.019**
Isophorone	~~ND~~ UJ	0.94	ug/L	0.061
2-Methylnaphthalene	**0.018 ~~J~~ J**	**0.19**	**ug/L**	**0.011**
2-Methylphenol	ND UJ	0.94	ug/L	0.081
4-Methylphenol	ND	0.94	ug/L	0.085
Naphthalene	ND	0.19	ug/L	0.013
Nitrobenzene	ND	1.9	ug/L	0.079
2-Nitrophenol	ND	0.94	ug/L	0.16
4-Nitrophenol	ND	4.7	ug/L	0.57
N-Nitrosodimethylamine	ND	0.94	ug/L	0.069
N-Nitrosodi-n-propylamine	ND	0.19	ug/L	0.029
N-Nitrosodiphenylamine	ND	0.94	ug/L	0.080
Pentachlorophenol	ND	0.94	ug/L	0.062
Phenanthrene	**0.12 ~~J~~ J**	**0.19**	**ug/L**	**0.040**
Phenol	ND UJ	0.19	ug/L	0.055
Pyrene	ND	0.19	ug/L	0.015
1,2,4-Trichlorobenzene	ND	0.94	ug/L	0.067
2,4,6-Trichlorophenol	ND	0.94	ug/L	0.16
Dibenzo(a,h)anthracene	**0.66 J**	**0.19**	**ug/L**	**0.015**
1-Methylnaphthalene	~~ND~~ UJ	0.19	ug/L	0.013
2,2'-oxybis(1-Chloropropane)	~~ND~~ UJ	0.19	ug/L	0.019

(Continued on next page)

NW
11/16/10

3RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 Work Order #...: L72114AX Matrix.....: WATER

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(23 - 112)
Terphenyl-d14	114	(10 - 132)
2-Fluorobiphenyl	70	(19 - 107)
2-Fluorophenol	19	(10 - 111)
Phenol-d5	40	(15 - 112)
2,4,6-Tribromophenol	55	(16 - 122)

Use original results

NOTE(S):

J Estimated result. Result is less than RL.

NW 11/16/10

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-004	**Work Order #...:**	L729K1AA	**Matrix.....:**	SOLID
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/12/10		
Prep Batch #...:	0280052	**Analysis Time..:**	05:06		
Dilution Factor:	15	**Initial Wgt/Vol:**	5 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:		**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	10000	ug/kg	2100
1,2-Dichlorobenzene	ND	500	ug/kg	52
1,3-Dichlorobenzene	ND	500	ug/kg	39
1,4-Dichlorobenzene	**110 J**	**500**	**ug/kg**	**36**
Benzoic acid	**460 J**	**2600**	**ug/kg**	**210**
Benzyl alcohol	ND	500	ug/kg	61
bis(2-Chloroethyl)-ether	ND	100	ug/kg	13
bis(2-Chloroethoxy) methane	ND	500	ug/kg	33
bis(2-Ethylhexyl) phthalate	**19000**	**1000**	**ug/kg**	**81**
4-Bromophenyl phenyl ether	ND	500	ug/kg	44
Butyl benzyl phthalate	**390 J**	**500**	**ug/kg**	**68**
4-Chloro-3-methylphenol	ND	500	ug/kg	46
2-Chloronaphthalene	ND	100	ug/kg	10
2-Chlorophenol	ND	500	ug/kg	41
4-Chlorophenyl phenyl ether	ND	500	ug/kg	56
Dibenzofuran	**250 J**	**500**	**ug/kg**	**49**
Di-n-butyl phthalate	**260 J**	**500**	**ug/kg**	**63**
3,3'-Dichlorobenzidine	ND	500	ug/kg	53
2,4-Dichlorophenol	ND	100	ug/kg	10
Diethyl phthalate	ND	500	ug/kg	55
4,6-Dinitro-2-methylphenol	ND	2600	ug/kg	200
2,4-Dimethylphenol	ND	500	ug/kg	78
Dimethyl phthalate	ND	500	ug/kg	55
2,4-Dinitrophenol	ND	2600	ug/kg	600
2,4-Dinitrotoluene	ND	500	ug/kg	40
2,6-Dinitrotoluene	ND	500	ug/kg	52
1,2-Diphenylhydrazine	ND	500	ug/kg	64
Di-n-octyl phthalate	ND	500	ug/kg	53
Hexachlorobenzene	ND	100	ug/kg	11
Hexachlorobutadiene	ND	100	ug/kg	11
Hexachloroethane	ND	500	ug/kg	36

(Continued on next page)

LW 11/16/10

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-004 **Work Order #...:** L729K1AA **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	500	ug/kg	54
Isophorone	ND	500	ug/kg	38
2-Methylphenol	ND	500	ug/kg	35
4-Methylphenol	**130 J**	**500**	**ug/kg**	**49**
Nitrobenzene	ND	1000	ug/kg	42
2-Nitrophenol	ND	500	ug/kg	55
4-Nitrophenol	ND	2600	ug/kg	170
N-Nitrosodiphenylamine	ND	500	ug/kg	46
N-Nitrosodimethylamine	ND	500	ug/kg	43
N-Nitrosodi-n-propylamine	ND	100	ug/kg	12
2,2'-oxybis (1-Chloropropane)	ND	100	ug/kg	11
Pentachlorophenol	ND	500	ug/kg	45
Phenol	ND	100	ug/kg	12
1,2,4-Trichlorobenzene	ND	500	ug/kg	28
2,4,6-Trichlorophenol	ND	500	ug/kg	75
2-Methylnaphthalene	**410**	**100**	**ug/kg**	**9.0**
1-Methylnaphthalene	**340**	**100**	**ug/kg**	**11**
Naphthalene	**740**	**100**	**ug/kg**	**8.6**
Acenaphthylene	**1300**	**100**	**ug/kg**	**11**
Acenaphthene	**250**	**100**	**ug/kg**	**9.6**
Fluorene	**350**	**100**	**ug/kg**	**13**
Phenanthrene	**4600**	**100**	**ug/kg**	**16**
Anthracene	**1200**	**100**	**ug/kg**	**9.8**
Fluoranthene	**9000**	**100**	**ug/kg**	**11**
Pyrene	**5900**	**100**	**ug/kg**	**10**
Benzo(a)anthracene	**3400**	**100**	**ug/kg**	**13**
Chrysene	**5200**	**100**	**ug/kg**	**12**
Benzo(b)fluoranthene	**5500 J**	**100**	**ug/kg**	**16**
Benzo(k)fluoranthene	~~ND~~ UJ	100	ug/kg	20
Benzo(a)pyrene	**3500**	**100**	**ug/kg**	**10**
Indeno(1,2,3-cd)pyrene	**1900**	**100**	**ug/kg**	**10**
Dibenzo(a,h)anthracene	**710**	**100**	**ug/kg**	**11**
Benzo(ghi)perylene	**2400**	**100**	**ug/kg**	**10**

(Continued on next page)

lw 11/16/10

4

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-004 **Work Order #...:** L729K1AA **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	59	(27 - 110)
Terphenyl-d14	53	(21 - 130)
2-Fluorobiphenyl	60	(28 - 108)
2-Fluorophenol	67	(28 - 107)
Phenol-d5	68	(30 - 112)
2,4,6-Tribromophenol	68	(21 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

RWS
11/16/10

ENVIRONMENTAL
Data Services, Inc.

TOTAL ORGANIC CARBON (TOC) & HEXAVALENT CHROMIUM

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060466

Client: Maryland Environmental Service, Millersville, MD Date: November 16, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CP-SED-COMP	C0J060466-001	Soil
1MS	CP-SED-COMPMS	C0J060466-001MS	Soil
1MSD	CP-SED-COMPMSD	C0J060466-001MSD	Soil
1RE*	CP-SED-COMPDL	C0J060466-001DL	Soil
2	PR-SED-COMP	C0J060466-002	Soil
2RE*	PR-SED-COMPRE	C0J060466-002RE	Soil

* - Hexavalent chromium only

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, was used in evaluating the data in this summary report.

Holding Times - Both samples were prepared and analyzed within the recommended holding times for all of the above wet chemistry parameters.

Calibration - The ICV and CCV %R values were acceptable.

Method and Calibration Blanks - The method blanks and continuing calibration blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
1	Hexavalent chromium	0%/0%/OK	L/R	1, 2
1RE	Hexavalent chromium	0%/0%/OK	L/R	1RE, 2RE

LCS - The LCS samples exhibited acceptable %R values.

Field Duplicates - Field duplicate samples were not included in this package.

Compound Quantitation - Both samples were analyzed at a dilution due to high concentrations of target compounds (TOC).

In EDS sample ID #1, the MS/MSD samples did not recover for hexavalent chromium due to matrix interference. The lab reanalyzed this sample with similar results. The original results for hexavalent chromium should be used for reporting purposes.

1-2, 1-2 RE

MES/EA Sparrows Point

CR, Hexavalent

Lab Name: TESTAMERICA PITTSBURGH
Client Name: EA Engineering, Science and Technology
Matrix: SOLID

Method: SW846 7196A
Lot Number: C0J060466

Alkaline Digestion for Hexavalent Chromium

Client Sample ID	Sample Number	Workorder	Result	Units	Method Detection Limit	Reporting Limit	Dilution Factor	Prep Date - Analysis Date/Time	QC Batch	
CP-SED-COMP	C0J060466 001	L721C1A1	R ~~ND~~	mg/kg	0.22	0.92	0.98	10/8/2010 - 10/11/2010 14:40	0281104	1
CP-SED-COMP use original	C0J060466 001	L721C2A1	R ~~ND~~	mg/kg	0.23	0.95	1.01	10/8/2010 - 10/11/2010 15:05	0281119	1RE
PR-SED-COMP	C0J060466 002	L721W2AC	L 0.64	mg/kg	0.12	0.49	0.98	10/8/2010 - 10/11/2010 15:10	0281119	2
PR-SED-COMP use original	C0J060466 002	L721W1AC	L 0.69	mg/kg	0.12	0.50	1	10/8/2010 - 10/11/2010 14:45	0281104	2RE

EDS

RW 11/16/10

MES/EA Sparrows Point

1-2

TOC

Lab Name: TESTAMERICA PITTSBURGH **Method:** EPA Lloyd Kahn

Client Name: EA Engineering, Science and Technology **Lot Number:** C0J060466

Matrix: SOLID

Total Organic Carbon by Lloyd Kahn

Client Sample ID	Sample Number	Workorder	Result	Units	Method Detection Limit	Reporting Limit	Dilution Factor	Prep Date - Analysis Date/Time	QC Batch	EDS #
CP-SED-COMP	C0J060466 001	L721C1A0	68200	mg/kg	642	4490	1.91	10/12/2010 - 10/14/2010 12:54	0285153	1
PR-SED-COMP	C0J060466 002	L721W1AA	2930	mg/kg	633	2330	1.87	10/12/2010 - 10/14/2010 13:22	0285153	2

nw
11/16/10

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0J190504

Karin Olsen

EA Engineering, Science and Te
15 Loveton Circle
Sparks, MD 21152

TESTAMERICA LABORATORIES, INC.

Carrie L. Gamber
Project Manager

November 15, 2010

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW --	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J190504

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on October 19, 2010. The cooler was received within the proper temperature range.

Note: The initial weight extracted for the sediment samples was adjusted to account for the percent moisture of each sample whenever possible.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Sample LAB-SED-COMP was analyzed at a 2X dilution due to matrix interference. This sample had surrgoates recover high and outside of the control limits. The SOP allows for surrogates to recover outside of the control limits on diluted analyes. All data was reported.

The method blank had diethyl phthalate detected between the MDL and the reporting limit. The result was flagged with a "J" qualifier. Any sample that this compound detected had the result flagged with a "B" qualifier.

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

Several continuing calibration standards had compounds with a %D >25%; but were within the expected performance range for these compounds.

PCB Congeners:
The continuing calibration standards were high and outside of the %D criteria. As the recoveries were high and the associated sample was non-detect for all target compounds, all data was reported.

Metals:
The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J190504

Metals (cont):
The method blank had iron detected at a concentration greater than the reporting limit. The iron detected in the sample was greater than 10X the concentration detected in the method blank. All data was reported.

General Chemistry:
The Lloyd Kahn TOC results for sample LAB-SED-COMP was calculated using the Dixon Test. Due to the variability of the results, in which the samples were analyzed 4 times, the Dixon test determined which results were to be used for the average calculation. The variability was more than likely due to the makeup of the samples.

The matrix spikes recovered outside of the control limits for hexavalent chromium. The samples were re-digested and re-analyzed. The matrix spikes again did not recover within the control limits confirming matrix interference. Both sets of data are reported.

TestAmerica's Burlington laboratory performed the grain size analysis. All data is included in the package.

METHODS SUMMARY

C0J190504

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
Hexavalent Chromium	SW846 7196A	SW846 3060A
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
PCB Congeners by SW-846 8082	SW846 8082 Cong	SW846 3541 SOXH
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	
Total Residue as Percent Solids	SM20 2540G	
TOC Lloyd Kahn Lloyd Kahn	EPA Lloyd Kahn	EPA Lloyd Kahn

References:

EPA "EASTERN ENVIRONMENTAL RADIATION FACILITY RADIOCHEMISTRY PROCEDURES MANUAL" US EPA EPA 520/5-84-006 AUGUST 1984

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0J190504

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L8P2J	001	LAB-SED-COMP	10/18/10	16:00

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

C0J190504

Client:
EA Engineering Science, and Technology, Inc.

15 Loveton Circle
Sparks, MD 21152

Project Manager:
Mike Ciarlo

Phone: **410-771-4950**

Field Contact:
Rob Ballentine
Phone: **410-627-2731**

Project Name: Coke Point Sediment Sampling
TA Quote#: 18005943
Project#: 1453417 0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Date	Time	Tissue	Sediment	Sample Identification	No. of Containers	Semivolatiles and PAHs SW846 8270C	Metals (ITM) ICP/MS 6020	Mercury 7471A	PCB Congeners 8082	Total Organic Carbon by Combustion (Lloyd Kahn)	Grain Size (Sieve and Hydrometer)		Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
10/18/2010	1600		X	LAB-SED-COMP	2	X	X	X	X	X	X						
10/18/2010	1530	X		CP-MOAM-FT-A									X	X	X	X	X

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN: Carrie Gamber

Remarks

SEE PROJECT SPECIFIC ANALYTE LIST

CP-MOAM-FT-A listed here is a resample to replace specimens lost in processing error at lab

LAB-SED-COMP is a sediment sample for analysis that was not available to send previously

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	10-18-2010 1700		
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**
[signature]	~~10/19/10 0945~~	[signature]	10/19/10 0945

Coke Point Sediment Samples

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(1 - 61)

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J190504

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	LAB-SED-COMP	C0J190504-001	Soil

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - The sample was prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Blank ID	Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
MB	Arsenic	0.019	0.095	None	All > 5X
	Chromium	0.024	0.12	None	
	Iron	4.5	22.5	None	

Field and Equipment Blank - Field QC samples were not included in this data package.

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
Reference	Antimony	59%/64%/OK	L/UL	1
	Copper	62%/OK/OK	L/UL	

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - An ICP serial dilution sample was not analyzed.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

The laboratory used (J) flags to indicate blank contamination which the reviewer deleted since the results were not affected.

EA Engineering, Science and Technology

Client Sample ID: LAB-SED-COMP

TOTAL Metals

Lot-Sample #...: C0J190504-001 Matrix.....: SOLID
Date Sampled...: 10/18/10 Date Received..: 10/19/10
% Moisture.....: 18

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0298237						
Aluminum	6010	2.1	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AD
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.20	
Antimony	0.031 B L	0.14	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AE
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0018	
Arsenic	1.3 J	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AF
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.013	
Beryllium	0.094	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AG
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0052	
Cadmium	0.072	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AH
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0049	
Chromium	16.5 J	0.14	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AJ
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0042	
Cobalt	3.4	0.035	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AK
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0010	
Copper	5.8 L	0.14	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AL
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.023	
Iron	10000 J	3.5	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AM
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.25	

(Continued on next page)

MW 12/7/10

EA Engineering, Science and Technology

Client Sample ID: LAB-SED-COMP

TOTAL Metals

Lot-Sample #...: C0J190504-001 Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	1.1	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AN
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0026	
Manganese	119	0.035	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AP
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0072	
Nickel	22.6	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AQ
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0079	
Selenium	0.35	0.35	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AR
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.035	
Silver	0.014 ~~B~~ J	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AT
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0027	
Thallium	0.055 ~~B~~ J	0.070	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AU
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.0014	
Tin	0.24 ~~B~~ J	0.35	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AV
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.041	
Zinc	17.8	0.35	mg/kg	SW846 6020	10/25-10/29/10	L8P2J1AW
		Dilution Factor: 0.57		Analysis Time..: 20:34	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0298152	MDL.....: 0.045	

Prep Batch #...: 0316011

Mercury	ND	0.020	mg/kg	SW846 7471A	11/12/10	L8P2J1A3
		Dilution Factor: 0.5		Analysis Time..: 08:41	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0316003	MDL.....: 0.0067	

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW 12/7/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J190504

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	LAB-SED-COMP	C0J190504-001	Soil

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - All compounds exhibited high %D values in the continuing calibration analyzed on 11/14/10, and have been qualified estimated (J/UJ) by the reviewer.

Surrogates - The sample exhibited acceptable surrogate recoveries.

MS/MSD - A MS/MSD sample was not analyzed.

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - All criteria were met.

EA Engineering, Science and Technology

Client Sample ID: LAB-SED-COMP

GC Semivolatiles

Lot-Sample #...:	C0J190504-001	Work Order #...:	L8P2J1A2	Matrix.....:	SOLID
Date Sampled...:	10/18/10	Date Received..:	10/19/10	MS Run #.....:	0295036
Prep Date.....:	10/22/10	Analysis Date..:	11/04/10		
Prep Batch #...:	0295056	Analysis Time..:	14:19		
Dilution Factor:	0.98	Initial Wgt/Vol:	12.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	18	Analyst ID.....:	014878	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND UJ	0.20	ug/kg	0.042
PCB 18 (BZ)	ND	0.20	ug/kg	0.027
PCB 28 (BZ)	ND	0.20	ug/kg	0.045
PCB 44 (BZ)	ND	0.20	ug/kg	0.041
PCB 49 (BZ)	ND	0.20	ug/kg	0.042
PCB 52 (BZ)	ND	0.20	ug/kg	0.040
PCB 66 (BZ)	ND	0.20	ug/kg	0.033
PCB 77 (BZ)	ND	0.20	ug/kg	0.044
PCB 87 (BZ)	ND	0.20	ug/kg	0.037
PCB 90 (BZ)	ND	0.20	ug/kg	0.031
PCB 101 (BZ)	ND	0.20	ug/kg	0.040
PCB 105 (BZ)	ND	0.20	ug/kg	0.042
PCB 118 (BZ)	ND	0.20	ug/kg	0.041
PCB 126 (BZ)	ND	0.20	ug/kg	0.052
PCB 128 (BZ)	ND	0.20	ug/kg	0.041
PCB 138 (BZ)	ND	0.20	ug/kg	0.043
PCB 153 (BZ)	ND	0.20	ug/kg	0.042
PCB 156 (BZ)	ND	0.20	ug/kg	0.041
PCB 169 (BZ)	ND	0.20	ug/kg	0.039
PCB 170 (BZ)	ND	0.20	ug/kg	0.041
PCB 180 (BZ)	ND	0.20	ug/kg	0.041
PCB 183 (BZ)	ND	0.20	ug/kg	0.040
PCB 184 (BZ)	ND	0.20	ug/kg	0.034
PCB 187 (BZ)	ND	0.20	ug/kg	0.042
PCB 195 (BZ)	ND	0.20	ug/kg	0.040
PCB 206 (BZ)	ND	0.20	ug/kg	0.040
PCB 209 (BZ)	ND	0.20	ug/kg	0.043

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	51	(35 - 140)
PCB 205 (BZ)	64	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

NW 12/7/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS
USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060466

Client: Maryland Environmental Service, Millersville, MD Date: November 16, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	CP-SED-COMP	C0J060466-001	Soil
1MS	CP-SED-COMPMS	C0J060466-001MS	Soil
1MSD	CP-SED-COMPMSD	C0J060466-001MSD	Soil
1DL	CP-SED-COMPDL	C0J060466-001DL	Soil
2	PR-SED-COMP	C0J060466-002	Soil
3	RB100510A	C0J060466-003	Water
3RE	RB100510ARE	C0J060466-003RE	Water
4	SRM	C0J060466-004	Soil

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 7 days for water samples, 14 days for soil samples and analyzed within 40 days for all samples except the following.

Sample	Date Sampled	Date Extracted	# of Days	Qualifier
3RE	10/05/10	10/14/10	9	J/UJ

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
1	All surrogates	"0D"	None- diluted out
1DL	All surrogates	"0D"	None- diluted out
3	S6= 2,4,6-Tribromophenol	4.4%	J/R- All acid compounds

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
1	All compounds	"0D"	None- diluted out

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria.

Method Blank - The method blanks exhibited the following contamination.

Blank ID	Compound	Conc. ug/L	Action Level ug/L	Qualifier	Affected Samples
L77TR1AA	Butylbenzylphthalate	0.15	1.5	None	All ND
	Acenaphthene	0.025	0.125	B	3
	Phenanthrene	0.16	0.80	B	3

Field, Equipment Blank - Field QC results are summarized below.

Blank ID	Compound	Conc. ug/L	Action Level ug/kg	Qualifier	Affected Samples
RB100510A	Fluoranthene	0.015	2.5	None	All > 5X

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - EDS sample ID # 1 exhibited a high concentration of the compound naphthalene and was flagged (E) by the laboratory. The sample was diluted and reanalyzed, and the dilution result for naphthalene should be used for reporting purposes.

EDS sample ID #3 (RB100510A- rinsate blank RE) exhibited high concentrations of several target compounds and appears to have been contaminated. The original results should be used for reporting purposes even though the acid results have been rejected.

The compounds benzo(b)fluoranthene and benzo(k)fluoranthene could not be separated. Therefore, the results were reported as benzo(b)fluoranthene and were non-detect for benzo(k)fluoranthene. The reviewer has qualified these results estimated (J/UJ) in all soil samples.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-001	**Work Order #...:**	L721C1AC	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 14:50	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0280052	**Analysis Time..:**	14:26		
Dilution Factor:	24.8	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	58	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	39000	ug/kg	8200
1,2-Dichlorobenzene	ND	1900	ug/kg	200
1,3-Dichlorobenzene	ND	1900	ug/kg	150
1,4-Dichlorobenzene	ND	1900	ug/kg	140
Benzoic acid	ND	9900	ug/kg	810
Benzyl alcohol	ND	1900	ug/kg	240
bis(2-Chloroethyl)-ether	ND	390	ug/kg	52
bis(2-Chloroethoxy) methane	ND	1900	ug/kg	130
bis(2-Ethylhexyl) phthalate	**1200 J**	**3900**	**ug/kg**	**320**
4-Bromophenyl phenyl ether	ND	1900	ug/kg	170
Butyl benzyl phthalate	ND	1900	ug/kg	270
4-Chloro-3-methylphenol	ND	1900	ug/kg	180
2-Chloronaphthalene	ND	390	ug/kg	41
2-Chlorophenol	ND	1900	ug/kg	160
4-Chlorophenyl phenyl ether	ND	1900	ug/kg	220
Dibenzofuran	**2800**	**1900**	**ug/kg**	**190**
Di-n-butyl phthalate	ND	1900	ug/kg	240
3,3'-Dichlorobenzidine	ND	1900	ug/kg	210
2,4-Dichlorophenol	ND	390	ug/kg	39
Diethyl phthalate	ND	1900	ug/kg	210
4,6-Dinitro-2-methylphenol	ND	9900	ug/kg	780
2,4-Dimethylphenol	ND	1900	ug/kg	300
Dimethyl phthalate	ND	1900	ug/kg	210
2,4-Dinitrophenol	ND	9900	ug/kg	2300
2,4-Dinitrotoluene	ND	1900	ug/kg	160
2,6-Dinitrotoluene	ND	1900	ug/kg	200
1,2-Diphenylhydrazine	ND	1900	ug/kg	250
Di-n-octyl phthalate	ND	1900	ug/kg	210
Hexachlorobenzene	ND	390	ug/kg	42
Hexachlorobutadiene	ND	390	ug/kg	44
Hexachloroethane	ND	1900	ug/kg	140

(Continued on next page)

LW 11/16/10

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C1AC Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	1900	ug/kg	210
Isophorone	ND	1900	ug/kg	150
2-Methylphenol	ND	1900	ug/kg	140
4-Methylphenol	**230 J**	**1900**	**ug/kg**	**190**
Nitrobenzene	ND	3900	ug/kg	160
2-Nitrophenol	ND	1900	ug/kg	210
4-Nitrophenol	ND	9900	ug/kg	660
N-Nitrosodiphenylamine	ND	1900	ug/kg	180
N-Nitrosodimethylamine	ND	1900	ug/kg	170
N-Nitrosodi-n-propylamine	ND	390	ug/kg	46
2,2'-oxybis (1-Chloropropane)	ND	390	ug/kg	42
Pentachlorophenol	ND	1900	ug/kg	170
Phenol	ND	390	ug/kg	46
1,2,4-Trichlorobenzene	ND	1900	ug/kg	110
2,4,6-Trichlorophenol	ND	1900	ug/kg	290
2-Methylnaphthalene	**2800**	**390**	**ug/kg**	**35**
1-Methylnaphthalene	**1400**	**390**	**ug/kg**	**42**
Naphthalene	83000 ~~**87000 B**~~	180 ~~**390**~~	**ug/kg**	67 ~~**34**~~
Acenaphthylene	**5600**	**390**	**ug/kg**	**45**
Acenaphthene	**2800**	**390**	**ug/kg**	**37**
Fluorene	**2900**	**390**	**ug/kg**	**51**
Phenanthrene	**15000**	**390**	**ug/kg**	**62**
Anthracene	**12000**	**390**	**ug/kg**	**38**
Fluoranthene	**59000**	**390**	**ug/kg**	**42**
Pyrene	**31000**	**390**	**ug/kg**	**39**
Benzo(a)anthracene	**27000**	**390**	**ug/kg**	**49**
Chrysene	**26000**	**390**	**ug/kg**	**46**
Benzo(b)fluoranthene	**35000** J	**390**	**ug/kg**	**61**
Benzo(k)fluoranthene	~~ND~~ UJ	390	ug/kg	79
Benzo(a)pyrene	**29000**	**390**	**ug/kg**	**39**
Indeno(1,2,3-cd)pyrene	**14000**	**390**	**ug/kg**	**40**
Dibenzo(a,h)anthracene	**4900**	**390**	**ug/kg**	**43**
Benzo(ghi)perylene	**15000**	**390**	**ug/kg**	**39**

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MW
11/16/10

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C1AC Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

E Estimated result. Result concentration exceeds the calibration range.

NW
11/16/10

IDL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-001	**Work Order #...:**	L721C2AC	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 14:50	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/12/10		
Prep Batch #...:	0280052	**Analysis Time..:**	04:45		
Dilution Factor:	49.66	**Initial Wgt/Vol:**	30.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	58	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

Use original results

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	78000	ug/kg	16000
1,2-Dichlorobenzene	ND	3900	ug/kg	410
1,3-Dichlorobenzene	ND	3900	ug/kg	300
1,4-Dichlorobenzene	ND	3900	ug/kg	280
Benzoic acid	ND	20000	ug/kg	1600
Benzyl alcohol	ND	3900	ug/kg	470
bis(2-Chloroethyl)-ether	ND	780	ug/kg	100
bis(2-Chloroethoxy) methane	ND	3900	ug/kg	260
bis(2-Ethylhexyl) phthalate	**1100 J**	**7800**	**ug/kg**	**630**
4-Bromophenyl phenyl ether	ND	3900	ug/kg	340
Butyl benzyl phthalate	ND	3900	ug/kg	530
4-Chloro-3-methylphenol	ND	3900	ug/kg	360
2-Chloronaphthalene	ND	780	ug/kg	81
2-Chlorophenol	ND	3900	ug/kg	320
4-Chlorophenyl phenyl ether	ND	3900	ug/kg	430
Dibenzofuran	**2400 J**	**3900**	**ug/kg**	**380**
Di-n-butyl phthalate	ND	3900	ug/kg	490
3,3'-Dichlorobenzidine	ND	3900	ug/kg	410
2,4-Dichlorophenol	ND	780	ug/kg	78
Diethyl phthalate	ND	3900	ug/kg	430
4,6-Dinitro-2-methylphenol	ND	20000	ug/kg	1600
2,4-Dimethylphenol	ND	3900	ug/kg	610
Dimethyl phthalate	ND	3900	ug/kg	430
2,4-Dinitrophenol	ND	20000	ug/kg	4600
2,4-Dinitrotoluene	ND	3900	ug/kg	320
2,6-Dinitrotoluene	ND	3900	ug/kg	400
1,2-Diphenylhydrazine	ND	3900	ug/kg	500
Di-n-octyl phthalate	ND	3900	ug/kg	410
Hexachlorobenzene	ND	780	ug/kg	83
Hexachlorobutadiene	ND	780	ug/kg	87
Hexachloroethane	ND	3900	ug/kg	280

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11/16/10

1DL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 Work Order #...: L721C2AC Matrix.....: SOLID

use original results

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	3900	ug/kg	420
Isophorone	ND	3900	ug/kg	290
2-Methylphenol	ND	3900	ug/kg	270
4-Methylphenol	ND	3900	ug/kg	380
Nitrobenzene	ND	7800	ug/kg	320
2-Nitrophenol	ND	3900	ug/kg	430
4-Nitrophenol	ND	20000	ug/kg	1300
N-Nitrosodiphenylamine	ND	3900	ug/kg	360
N-Nitrosodimethylamine	ND	3900	ug/kg	330
N-Nitrosodi-n-propylamine	ND	780	ug/kg	92
2,2'-oxybis (1-Chloropropane)	ND	780	ug/kg	84
Pentachlorophenol	ND	3900	ug/kg	350
Phenol	ND	780	ug/kg	92
1,2,4-Trichlorobenzene	ND	3900	ug/kg	220
2,4,6-Trichlorophenol	ND	3900	ug/kg	580
2-Methylnaphthalene	2500	780	ug/kg	70
1-Methylnaphthalene	1200	780	ug/kg	83
Naphthalene	83000	780	ug/kg	67
Acenaphthylene	3800	780	ug/kg	89
Acenaphthene	2400	780	ug/kg	75
Fluorene	2400	780	ug/kg	100
Phenanthrene	12000	780	ug/kg	120
Anthracene	10000	780	ug/kg	76
Fluoranthene	46000	780	ug/kg	83
Pyrene	29000	780	ug/kg	79
Benzo(a)anthracene	23000	780	ug/kg	98
Chrysene	22000	780	ug/kg	93
Benzo(b)fluoranthene	30000 J	780	ug/kg	120
Benzo(k)fluoranthene	~~ND~~ UJ	780	ug/kg	160
Benzo(a)pyrene	24000	780	ug/kg	78
Indeno(1,2,3-cd)pyrene	11000	780	ug/kg	80
Dibenzo(a,h)anthracene	4000	780	ug/kg	87
Benzo(ghi)perylene	12000	780	ug/kg	78

(Continued on next page)

NW 11/16/10

1DL

EA Engineering, Science and Technology

Client Sample ID: CP-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-001 **Work Order #...:** L721C2AC **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	NC,DIL	(27 - 110)
Terphenyl-d14	NC,DIL	(21 - 130)
2-Fluorobiphenyl	NC,DIL	(28 - 108)
2-Fluorophenol	NC,DIL	(28 - 107)
Phenol-d5	NC,DIL	(30 - 112)
2,4,6-Tribromophenol	NC,DIL	(21 - 116)

Use original results

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

NW
11/16/10

EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-002	**Work Order #...:**	L721W1AG	**Matrix.....:**	SOLID
Date Sampled...:	10/01/10 13:25	**Date Received..:**	10/06/10 10:00	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0280052	**Analysis Time..:**	15:26		
Dilution Factor:	2.49	**Initial Wgt/Vol:**	30.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	20	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
1,4-Dichlorobenzene	ND	100	ug/kg	7.4
Benzidine	ND	2100	ug/kg	430
1,2-Dichlorobenzene	ND	100	ug/kg	11
1,3-Dichlorobenzene	ND	100	ug/kg	8.0
Benzoic acid	ND	530	ug/kg	43
Benzyl alcohol	ND	100	ug/kg	12
bis(2-Chloroethyl)-ether	ND	21	ug/kg	2.8
bis(2-Chloroethoxy) methane	ND	100	ug/kg	6.8
bis(2-Ethylhexyl) phthalate	ND	210	ug/kg	17
4-Bromophenyl phenyl ether	ND	100	ug/kg	9.0
Butyl benzyl phthalate	ND	100	ug/kg	14
4-Chloro-3-methylphenol	ND	100	ug/kg	9.5
2-Chloronaphthalene	ND	21	ug/kg	2.2
2-Chlorophenol	ND	100	ug/kg	8.4
4-Chlorophenyl phenyl ether	ND	100	ug/kg	11
Dibenzofuran	ND	100	ug/kg	10
Di-n-butyl phthalate	ND	100	ug/kg	13
3,3'-Dichlorobenzidine	ND	100	ug/kg	11
2,4-Dichlorophenol	ND	21	ug/kg	2.1
Diethyl phthalate	ND	100	ug/kg	11
4,6-Dinitro-2-methylphenol	ND	530	ug/kg	42
2,4-Dimethylphenol	ND	100	ug/kg	16
Dimethyl phthalate	ND	100	ug/kg	11
2,4-Dinitrophenol	ND	530	ug/kg	120
2,4-Dinitrotoluene	ND	100	ug/kg	8.3
2,6-Dinitrotoluene	ND	100	ug/kg	11
1,2-Diphenylhydrazine	ND	100	ug/kg	13
Di-n-octyl phthalate	ND	100	ug/kg	11
Hexachlorobenzene	ND	21	ug/kg	2.2
Hexachlorobutadiene	ND	21	ug/kg	2.3
Hexachloroethane	ND	100	ug/kg	7.4

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NW
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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-002 Work Order #...: L721W1AG Matrix.....: SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	100	ug/kg	11
Isophorone	ND	100	ug/kg	7.8
2-Methylphenol	ND	100	ug/kg	7.2
4-Methylphenol	ND	100	ug/kg	10
Nitrobenzene	ND	210	ug/kg	8.6
2-Nitrophenol	ND	100	ug/kg	11
4-Nitrophenol	ND	530	ug/kg	35
N-Nitrosodiphenylamine	ND	100	ug/kg	9.6
N-Nitrosodimethylamine	ND	100	ug/kg	8.9
N-Nitrosodi-n-propylamine	ND	21	ug/kg	2.4
2,2'-oxybis (1-Chloropropane)	ND	21	ug/kg	2.2
Pentachlorophenol	ND	100	ug/kg	9.2
Phenol	ND	21	ug/kg	2.4
1,2,4-Trichlorobenzene	ND	100	ug/kg	5.7
2,4,6-Trichlorophenol	ND	100	ug/kg	15
2-Methylnaphthalene	ND	21	ug/kg	1.9
1-Methylnaphthalene	ND	21	ug/kg	2.2
Naphthalene	**21**	**21**	**ug/kg**	**1.8**
Acenaphthylene	**10 J**	**21**	**ug/kg**	**2.4**
Acenaphthene	ND	21	ug/kg	2.0
Fluorene	ND	21	ug/kg	2.7
Phenanthrene	**12 J**	**21**	**ug/kg**	**3.3**
Anthracene	**8.2 J**	**21**	**ug/kg**	**2.0**
Fluoranthene	**23**	**21**	**ug/kg**	**2.2**
Pyrene	**16 J**	**21**	**ug/kg**	**2.1**
Benzo(a)anthracene	**12 J**	**21**	**ug/kg**	**2.6**
Chrysene	**10 J**	**21**	**ug/kg**	**2.5**
Benzo(b)fluoranthene	**16 ~~J~~ J**	**21**	**ug/kg**	**3.2**
Benzo(k)fluoranthene	~~ND~~ U J	21	ug/kg	4.2
Benzo(a)pyrene	**12 J**	**21**	**ug/kg**	**2.1**
Indeno(1,2,3-cd)pyrene	ND	21	ug/kg	2.1
Dibenzo(a,h)anthracene	ND	21	ug/kg	2.3
Benzo(ghi)perylene	ND	21	ug/kg	2.1

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lw
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EA Engineering, Science and Technology

Client Sample ID: PR-SED-COMP

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-002 Work Order #...: L721W1AG Matrix.....: SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	46	(27 - 110)
Terphenyl-d14	45	(21 - 130)
2-Fluorobiphenyl	49	(28 - 108)
2-Fluorophenol	49	(28 - 107)
Phenol-d5	45	(30 - 112)
2,4,6-Tribromophenol	38	(21 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

CW 11/16/10

3

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-003	**Work Order #...:**	L72111AX	**Matrix.....:**	WATER
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	
Prep Date.....:	10/08/10	**Analysis Date..:**	10/11/10		
Prep Batch #...:	0282028	**Analysis Time..:**	21:37		
Dilution Factor:	0.95	**Initial Wgt/Vol:**	1050 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	430261	**Instrument ID..:**	732		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	19	ug/L	3.3
1,2-Dichlorobenzene	ND	0.95	ug/L	0.071
1,3-Dichlorobenzene	ND	0.95	ug/L	0.071
1,4-Dichlorobenzene	ND	0.95	ug/L	0.071
Benzoic acid	~~ND~~ R	4.8	ug/L	0.53
Benzyl alcohol	~~ND~~ R	0.95	ug/L	0.20
bis(2-Chloroethyl)-ether	ND	0.19	ug/L	0.024
bis(2-Chloroethoxy) methane	ND	0.95	ug/L	0.055
bis(2-Ethylhexyl) phthalate	ND	1.9	ug/L	0.76
4-Bromophenyl phenyl ether	ND	0.95	ug/L	0.060
Butyl benzyl phthalate	ND	0.95	ug/L	0.14
4-Chloro-3-methylphenol	~~ND~~ R	0.95	ug/L	0.072
2-Chloronaphthalene	ND	0.19	ug/L	0.014
2-Chlorophenol	~~ND~~ R	0.95	ug/L	0.16
4-Chlorophenyl phenyl ether	ND	0.95	ug/L	0.048
Dibenzofuran	ND	0.95	ug/L	0.059
Di-n-butyl phthalate	ND	0.95	ug/L	0.12
3,3'-Dichlorobenzidine	ND	0.95	ug/L	0.11
2,4-Dichlorophenol	~~ND~~ R	0.19	ug/L	0.032
Diethyl phthalate	ND	0.95	ug/L	0.14
4,6-Dinitro-2-methylphenol	~~ND~~ R	4.8	ug/L	0.21
2,4-Dimethylphenol	~~ND~~ R	0.95	ug/L	0.081
Dimethyl phthalate	ND	0.95	ug/L	0.073
2,4-Dinitrophenol	~~ND~~ R	4.8	ug/L	0.58
2,4-Dinitrotoluene	ND	0.95	ug/L	0.051
2,6-Dinitrotoluene	ND	0.95	ug/L	0.076
1,2-Diphenylhydrazine	ND	0.95	ug/L	0.063
Di-n-octyl phthalate	ND	0.95	ug/L	0.20
Hexachlorobenzene	ND	0.19	ug/L	0.017
Hexachlorobutadiene	ND	0.19	ug/L	0.016
Hexachloroethane	ND	0.95	ug/L	0.060

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EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 **Work Order #...:** L72111AX **Matrix.....:** WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	0.95	ug/L	0.049
Isophorone	ND	0.95	ug/L	0.061
2-Methylphenol	~~ND~~ R	0.95	ug/L	0.082
4-Methylphenol	~~ND~~ R	0.95	ug/L	0.086
Nitrobenzene	ND	1.9	ug/L	0.080
2-Nitrophenol	~~ND~~ R	0.95	ug/L	0.16
4-Nitrophenol	~~ND~~ R	4.8	ug/L	0.57
N-Nitrosodiphenylamine	ND	0.95	ug/L	0.081
N-Nitrosodimethylamine	ND	0.95	ug/L	0.070
N-Nitrosodi-n-propylamine	ND	0.19	ug/L	0.029
2,2'-oxybis (1-Chloropropane)	ND	0.19	ug/L	0.019
Pentachlorophenol	~~ND~~ R	0.95	ug/L	0.063
Phenol	~~ND~~ R	0.19	ug/L	0.055
1,2,4-Trichlorobenzene	ND	0.95	ug/L	0.068
2,4,6-Trichlorophenol	~~ND~~ R	0.95	ug/L	0.17
2-Methylnaphthalene	ND	0.19	ug/L	0.012
1-Methylnaphthalene	ND	0.19	ug/L	0.013
Naphthalene	ND	0.19	ug/L	0.013
Acenaphthylene	ND	0.19	ug/L	0.014
Acenaphthene	**0.024 ~~J,B~~ B**	**0.19**	**ug/L**	**0.014**
Fluorene	ND	0.19	ug/L	0.021
Phenanthrene	**0.15 ~~J,B~~ B**	**0.19**	**ug/L**	**0.041**
Anthracene	ND	0.19	ug/L	0.015
Fluoranthene	**0.015 J**	**0.19**	**ug/L**	**0.015**
Pyrene	ND	0.19	ug/L	0.015
Benzo(a)anthracene	ND	0.19	ug/L	0.014
Chrysene	ND	0.19	ug/L	0.013
Benzo(b)fluoranthene	ND	0.19	ug/L	0.015
Benzo(k)fluoranthene	ND	0.19	ug/L	0.052
Benzo(a)pyrene	ND	0.19	ug/L	0.013
Indeno(1,2,3-cd)pyrene	ND	0.19	ug/L	0.019
Dibenzo(a,h)anthracene	ND	0.19	ug/L	0.015
Benzo(ghi)perylene	ND	0.19	ug/L	0.014

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EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 Work Order #...: L72111AX Matrix.....: WATER

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(23 - 112)
Terphenyl-d14	65	(10 - 132)
2-Fluorobiphenyl	62	(19 - 107)
2-Fluorophenol	52	(10 - 111)
Phenol-d5	69	(15 - 112)
2,4,6-Tribromophenol	4.4 *	(16 - 122)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW
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3RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

use original results

Lot-Sample #...:	C0J060466-003	**Work Order #...:**	L72114AX	**Matrix.....:**	WATER
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	
Prep Date.....:	10/14/10	**Analysis Date..:**	10/18/10		
Prep Batch #...:	0287214	**Analysis Time..:**	13:06		
Dilution Factor:	0.94	**Initial Wgt/Vol:**	1060 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	733		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	~~ND~~ UJ	0.19	ug/L	0.014
Acenaphthylene	~~ND~~	0.19	ug/L	0.014
Anthracene	~~ND~~	0.19	ug/L	0.014
Benzidine	~~ND~~	19	ug/L	3.3
Benzo(a)anthracene	**0.26** J	**0.19**	**ug/L**	**0.014**
Benzo(b)fluoranthene	**0.45**	**0.19**	**ug/L**	**0.015**
Benzo(k)fluoranthene	**0.51**	**0.19**	**ug/L**	**0.051**
Benzoic acid	~~ND~~ UJ	4.7	ug/L	0.53
Benzo(ghi)perylene	**0.45** J	**0.19**	**ug/L**	**0.014**
Benzo(a)pyrene	**0.30** J	**0.19**	**ug/L**	**0.013**
Benzyl alcohol	~~ND~~ UJ	0.94	ug/L	0.20
bis(2-Chloroethoxy) methane	~~ND~~	0.94	ug/L	0.055
bis(2-Chloroethyl)-ether	~~ND~~	0.19	ug/L	0.024
bis(2-Ethylhexyl) phthalate	**0.81** ~~J~~ J	**1.9**	**ug/L**	**0.75**
4-Bromophenyl phenyl ether	~~ND~~ UJ	0.94	ug/L	0.060
Butyl benzyl phthalate	~~ND~~	0.94	ug/L	0.13
4-Chloro-3-methylphenol	~~ND~~	0.94	ug/L	0.071
2-Chloronaphthalene	~~ND~~	0.19	ug/L	0.014
2-Chlorophenol	~~ND~~	0.94	ug/L	0.16
4-Chlorophenyl phenyl ether	~~ND~~	0.94	ug/L	0.047
Chrysene	**0.40** J	**0.19**	**ug/L**	**0.013**
Dibenzofuran	~~ND~~ UJ	0.94	ug/L	0.058
Di-n-butyl phthalate	~~ND~~	0.94	ug/L	0.12
1,2-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
1,3-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
1,4-Dichlorobenzene	~~ND~~	0.94	ug/L	0.070
3,3'-Dichlorobenzidine	~~ND~~	0.94	ug/L	0.11
2,4-Dichlorophenol	~~ND~~	0.19	ug/L	0.031
Diethyl phthalate	~~ND~~	0.94	ug/L	0.14
2,4-Dimethylphenol	~~ND~~	0.94	ug/L	0.080
Dimethyl phthalate	~~ND~~	0.94	ug/L	0.072
Di-n-octyl phthalate	**0.48** ~~J~~ J	**0.94**	**ug/L**	**0.19**

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3 RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

use original results

Lot-Sample #...: C0J060466-003 Work Order #...: L72114AX Matrix.....: WATER

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
4,6-Dinitro-2-methylphenol	ND UJ	4.7	ug/L	0.21
2,4-Dinitrophenol	ND	4.7	ug/L	0.58
2,4-Dinitrotoluene	ND	0.94	ug/L	0.050
2,6-Dinitrotoluene	ND	0.94	ug/L	0.075
1,2-Diphenylhydrazine	ND	0.94	ug/L	0.062
Fluoranthene	**0.024 ~~J~~ J**	**0.19**	**ug/L**	**0.015**
Fluorene	**0.023 ~~J~~ J**	**0.19**	**ug/L**	**0.020**
Hexachlorobenzene	ND UJ	0.19	ug/L	0.017
Hexachlorobutadiene	ND	0.19	ug/L	0.016
Hexachlorocyclopentadiene	ND	0.94	ug/L	0.049
Hexachloroethane	ND	0.94	ug/L	0.059
Indeno(1,2,3-cd)pyrene	**0.52 J**	**0.19**	**ug/L**	**0.019**
Isophorone	~~ND~~ UJ	0.94	ug/L	0.061
2-Methylnaphthalene	**0.018 ~~J~~ J**	**0.19**	**ug/L**	**0.011**
2-Methylphenol	ND UJ	0.94	ug/L	0.081
4-Methylphenol	ND	0.94	ug/L	0.085
Naphthalene	ND	0.19	ug/L	0.013
Nitrobenzene	ND	1.9	ug/L	0.079
2-Nitrophenol	ND	0.94	ug/L	0.16
4-Nitrophenol	ND	4.7	ug/L	0.57
N-Nitrosodimethylamine	ND	0.94	ug/L	0.069
N-Nitrosodi-n-propylamine	ND	0.19	ug/L	0.029
N-Nitrosodiphenylamine	ND	0.94	ug/L	0.080
Pentachlorophenol	ND	0.94	ug/L	0.062
Phenanthrene	**0.12 ~~J~~ J**	**0.19**	**ug/L**	**0.040**
Phenol	ND UJ	0.19	ug/L	0.055
Pyrene	ND	0.19	ug/L	0.015
1,2,4-Trichlorobenzene	ND	0.94	ug/L	0.067
2,4,6-Trichlorophenol	ND	0.94	ug/L	0.16
Dibenzo(a,h)anthracene	**0.66 J**	**0.19**	**ug/L**	**0.015**
1-Methylnaphthalene	~~ND~~ UJ	0.19	ug/L	0.013
2,2'-oxybis(1-Chloropropane)	~~ND~~ UJ	0.19	ug/L	0.019

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NW
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3RE

EA Engineering, Science and Technology

Client Sample ID: RB100510A

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-003 Work Order #...: L72114AX Matrix.....: WATER

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(23 - 112)
Terphenyl-d14	114	(10 - 132)
2-Fluorobiphenyl	70	(19 - 107)
2-Fluorophenol	19	(10 - 111)
Phenol-d5	40	(15 - 112)
2,4,6-Tribromophenol	55	(16 - 122)

Use original results

NOTE(S):

J Estimated result. Result is less than RL.

NW 11/16/10

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...:	C0J060466-004	**Work Order #...:**	L729K1AA	**Matrix.....:**	SOLID
Date Sampled...:	10/05/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0280028
Prep Date.....:	10/07/10	**Analysis Date..:**	10/12/10		
Prep Batch #...:	0280052	**Analysis Time..:**	05:06		
Dilution Factor:	15	**Initial Wgt/Vol:**	5 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:		**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzidine	ND	10000	ug/kg	2100
1,2-Dichlorobenzene	ND	500	ug/kg	52
1,3-Dichlorobenzene	ND	500	ug/kg	39
1,4-Dichlorobenzene	**110 J**	**500**	**ug/kg**	**36**
Benzoic acid	**460 J**	**2600**	**ug/kg**	**210**
Benzyl alcohol	ND	500	ug/kg	61
bis(2-Chloroethyl)-ether	ND	100	ug/kg	13
bis(2-Chloroethoxy) methane	ND	500	ug/kg	33
bis(2-Ethylhexyl) phthalate	**19000**	**1000**	**ug/kg**	**81**
4-Bromophenyl phenyl ether	ND	500	ug/kg	44
Butyl benzyl phthalate	**390 J**	**500**	**ug/kg**	**68**
4-Chloro-3-methylphenol	ND	500	ug/kg	46
2-Chloronaphthalene	ND	100	ug/kg	10
2-Chlorophenol	ND	500	ug/kg	41
4-Chlorophenyl phenyl ether	ND	500	ug/kg	56
Dibenzofuran	**250 J**	**500**	**ug/kg**	**49**
Di-n-butyl phthalate	**260 J**	**500**	**ug/kg**	**63**
3,3'-Dichlorobenzidine	ND	500	ug/kg	53
2,4-Dichlorophenol	ND	100	ug/kg	10
Diethyl phthalate	ND	500	ug/kg	55
4,6-Dinitro-2-methylphenol	ND	2600	ug/kg	200
2,4-Dimethylphenol	ND	500	ug/kg	78
Dimethyl phthalate	ND	500	ug/kg	55
2,4-Dinitrophenol	ND	2600	ug/kg	600
2,4-Dinitrotoluene	ND	500	ug/kg	40
2,6-Dinitrotoluene	ND	500	ug/kg	52
1,2-Diphenylhydrazine	ND	500	ug/kg	64
Di-n-octyl phthalate	ND	500	ug/kg	53
Hexachlorobenzene	ND	100	ug/kg	11
Hexachlorobutadiene	ND	100	ug/kg	11
Hexachloroethane	ND	500	ug/kg	36

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EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-004 **Work Order #...:** L729K1AA **Matrix.....:** SOLID

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Hexachlorocyclopentadiene	ND	500	ug/kg	54
Isophorone	ND	500	ug/kg	38
2-Methylphenol	ND	500	ug/kg	35
4-Methylphenol	**130 J**	**500**	**ug/kg**	**49**
Nitrobenzene	ND	1000	ug/kg	42
2-Nitrophenol	ND	500	ug/kg	55
4-Nitrophenol	ND	2600	ug/kg	170
N-Nitrosodiphenylamine	ND	500	ug/kg	46
N-Nitrosodimethylamine	ND	500	ug/kg	43
N-Nitrosodi-n-propylamine	ND	100	ug/kg	12
2,2'-oxybis (1-Chloropropane)	ND	100	ug/kg	11
Pentachlorophenol	ND	500	ug/kg	45
Phenol	ND	100	ug/kg	12
1,2,4-Trichlorobenzene	ND	500	ug/kg	28
2,4,6-Trichlorophenol	ND	500	ug/kg	75
2-Methylnaphthalene	**410**	**100**	**ug/kg**	**9.0**
1-Methylnaphthalene	**340**	**100**	**ug/kg**	**11**
Naphthalene	**740**	**100**	**ug/kg**	**8.6**
Acenaphthylene	**1300**	**100**	**ug/kg**	**11**
Acenaphthene	**250**	**100**	**ug/kg**	**9.6**
Fluorene	**350**	**100**	**ug/kg**	**13**
Phenanthrene	**4600**	**100**	**ug/kg**	**16**
Anthracene	**1200**	**100**	**ug/kg**	**9.8**
Fluoranthene	**9000**	**100**	**ug/kg**	**11**
Pyrene	**5900**	**100**	**ug/kg**	**10**
Benzo(a)anthracene	**3400**	**100**	**ug/kg**	**13**
Chrysene	**5200**	**100**	**ug/kg**	**12**
Benzo(b)fluoranthene	**5500 J**	**100**	**ug/kg**	**16**
Benzo(k)fluoranthene	~~ND~~ UJ	100	ug/kg	20
Benzo(a)pyrene	**3500**	**100**	**ug/kg**	**10**
Indeno(1,2,3-cd)pyrene	**1900**	**100**	**ug/kg**	**10**
Dibenzo(a,h)anthracene	**710**	**100**	**ug/kg**	**11**
Benzo(ghi)perylene	**2400**	**100**	**ug/kg**	**10**

(Continued on next page)

lw 11/16/10

4

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...: C0J060466-004 **Work Order #...:** L729K1AA **Matrix.....:** SOLID

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	59	(27 - 110)
Terphenyl-d14	53	(21 - 130)
2-Fluorobiphenyl	60	(28 - 108)
2-Fluorophenol	67	(28 - 107)
Phenol-d5	68	(30 - 112)
2,4,6-Tribromophenol	68	(21 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

RWS
11/16/10

ENVIRONMENTAL
Data Services, Inc.

TOTAL ORGANIC CARBON (TOC) & HEXAVALENT CHROMIUM

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J190504

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	LAB-SED-COMP	C0J190504-001	Soil

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, was used in evaluating the data in this summary report.

Holding Times - The sample was prepared and analyzed within the recommended holding times for all of the above wet chemistry parameters.

Calibration - The ICV and CCV %R values were acceptable.

Method and Calibration Blanks - The method blanks and continuing calibration blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
Reference	Hexavalent chromium	54%/71%/OK	L/UL	1

LCS - The LCS samples exhibited acceptable %R values.

Field Duplicates - Field duplicate samples were not included in this package.

Compound Quantitation - All criteria were met.

MES/EA Sparrows Point

CR, Hexavalent

1

Lab Name:	TESTAMERICA PITTSBURGH	**Method:**	SW846 7196A
Client Name:	EA Engineering, Science and Technology	**Lot Number:**	C0J190504
Matrix:	SOLID		

Alkaline Digestion for Hexavalent Chromium

Client Sample ID	Sample Number	Workorder	Result	Units	Method Detection Limit	Reporting Limit	Dilution Factor	Prep Date - Analysis Date/Time	QC Batch
LAB-SED-COMP	C0J190504 001	L8P2J2A1	UL ~~ND~~	mg/kg	0.12	0.49	1	10/21/2010 - 10/23/2010 09:42	0294118
~~LAB-SED-COMP~~	~~C0J190504 001~~	~~L8P2J1A1~~	~~ND~~	~~mg/kg~~	~~0.12~~	~~0.49~~	~~1.01~~	~~10/21/2010 - 10/23/2010 09:22~~	~~0294111~~

1

MW 12/7/10

MES/EA Sparrows Point

TOC

1

Lab Name:	TESTAMERICA PITTSBURGH	**Method:**	EPA	Lloyd Kahn
Client Name:	EA Engineering, Science and Technology	**Lot Number:**	C0J190504	
Matrix:	SOLID			

Total Organic Carbon by Lloyd Kahn

Client Sample ID	Sample Number	Workorder	Result	Units	Method Detection Limit	Reporting Limit	Dilution Factor	Prep Date - Analysis Date/Time	QC Batch
LAB-SED-COMP	C0J190504 001	L8P2J1A0	J 659 B	mg/kg	332	1210	0.99	10/29/2010 - 11/1/2010 17:49	0302220

1

APPENDIX H:

ATTACHMENT D

TISSUE ANALYTICAL DATA REPORTS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0K090449

Karin Olsen

EA Engineering, Science and Te
15 Loveton Circle
Sparks, MD 21152

TESTAMERICA LABORATORIES, INC.

Carrie L. Gamber
Project Manager

December 10, 2010

301 Alpha Drive Pittsburgh, PA 15238 **tel** 412.963.7058 **fax** 412.963.2468 www.testamericainc.com

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW --	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0K090449

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on November 9, 2010. The coolers were received within the proper temperature range.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Due to the concentration of target compounds detected and/or matrix, the samples were analyzed at a dilution.

Several samples had surrogates recover high and outside of the contro limits due to matrix interfernce.

The relative percent difference between the matrix spike and the matrix spike duplicate of sample AT0-649A-W was outside of the cotnrol limits for naphthalene.

The matrix spike of sample AT0-649A-C recovered outside of the control limits for pyrene.

Several samples had internal standard area counts not meet criteria due to matrix interfernce.

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

Several continuing calibration standards had compounds with a %D >25%; but were within the expected performance range for these compounds.

PCB Congeners:
Due to the concentration of target compounds detected, the SRMs were analyzed at a dilution. These samples had the surrogates diluted out.

The matrix spike and matrix spike duplicate for sample AT0-649A-C recovered outside QC limits for PCB101 or PCB118. The RPD was outside limits for OCB156.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0K090449

Metals:
The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

For the matrix spike and matrix spike duplicate of sample AT0-649A-W, iron recoveries were not calculated due to the concentration of analyte in the sample being >4 times the concentration of spike added.

The matrix spike and matrix spike duplicate of sample AT0-649A-W recovered outside of the control limits for silver.

The matrix spike duplicate of sample AT0-649A-W recovered outside of the control limits for zinc.

The matrix spike of sample AT0-649A-C recovered outside of the control limits for iron.

The matrix spike duplicate of sample AT0-649A-C recovered outside of the control limits for silver.

General Chemistry:
There were no problems associated with the analysis.

Brooks Rand LLC performed the arsenic speciation analysis. Their report will follow under separate cover.

METHODS SUMMARY

C0K090449

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
Percent Lipids	SW846 Total Res	
Percent Moisture	SM20 2540G	
PCB Congeners by SW-846 8082	SW846 8082 Cong	
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	

References:

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0K090449

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L9QR7	001	AT0-649A-W	11/03/10	12:00
L9QTT	002	AT0-649B-W	11/03/10	12:00
L9QTV	003	AT0-649C-W	11/03/10	12:00
L9QTW	004	AT0-649D-W	11/03/10	12:00
L9QT0	005	AT0-649E-W	11/03/10	12:00
L9QT1	006	AT0-650A-W	11/03/10	12:00
L9QT3	007	AT0-650B-W	11/03/10	12:00
L9QT5	008	AT0-650C-W	11/03/10	12:00
L9QT6	009	AT0-650D-W	11/03/10	12:00
L9QVC	010	AT0-650E-W	11/03/10	12:00
L9QVE	011	AT0-682A-W	11/03/10	12:00
L9QVJ	012	AT0-682B-W	11/03/10	12:00
L9QVM	013	AT0-682C-W	11/03/10	12:00
L9QVP	014	PRETEST A-W	11/03/10	12:00
L9QVT	015	PRETEST B-W	11/03/10	12:00
L9QVW	016	PRETEST C-W	11/03/10	12:00
L9QV2	017	AT0-649A-C	11/04/10	12:00
L9QV4	018	AT0-649B-C	11/04/10	12:00
L9QV6	019	AT0-649C-C	11/04/10	12:00
L9QV7	020	AT0-649D-C	11/04/10	12:00
L9QV8	021	AT0-649E-C	11/04/10	12:00
L9QV9	022	AT0-650A-C	11/04/10	12:00
L9QWA	023	AT0-650B-C	11/04/10	12:00
L9QWC	024	AT0-650C-C	11/04/10	12:00
L9QWE	025	AT0-650D-C	11/04/10	12:00
L9QWF	026	AT0-650E-C	11/04/10	12:00
L9QWG	027	AT0-683A-C	11/04/10	12:00
L9QWH	028	AT0-683B-C	11/04/10	12:00
L9QWJ	029	AT0-683C-C	11/04/10	12:00
L9QWK	030	PRETESTA-C	11/04/10	12:00
L9QWL	031	PRETESTB-C	11/04/10	12:00
L9QWP	032	PRETESTC-C	11/04/10	12:00
L9RJP	033	SRM(metals 1566b, PAHs,PCBs 1944)	11/04/10	
L9RJQ	034	SRM(metals 1566b, PAHs,PCBs 1944)	11/04/10	

(Continued on next page)

SAMPLE SUMMARY

C0K090449

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Client:
EA Engineering Science, and Technology, Inc.

15 Loveton Circle
Sparks, MD 21152

Project Manager:
Karin Olsen

Phone: **410.329.5112**

Quote:

Project Name: Coke Point

Project#: **1453417 0008E**

Page 1 of 1

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238

phone: 412.963.2428
fax: 412.963.2468

ATTN: Carrie Gamber

Date	Time	Tissue	Sediment	Sample Identification	No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM	PCB Congeners (SW846 8082)	Arsenic Speciation (FPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)	Remarks
11/3/10	1200	X		AT0-649A-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-649B-W	1	X	X	X	X	X	PLEASE RUN MS/MSD ON ONE
11/3/10	1200	X		AT0-649C-W	1	X	X	X	X	X	WORM AND ONE CLAM SAMPLE
11/3/10	1200	X		AT0-649D-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-649E-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-650A-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-650B-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-650C-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-650D-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-650E-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-682A-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-682B-W	1	X	X	X	X	X	
11/3/10	1200	X		AT0-682C-W	1	X	X	X	X	X	
10/5/10	1200	X		PRETEST A-W	1	X	X	X	X	X	
10/5/10	1200	X		PRETEST B-W	1	X	X	X	X	X	
10/5/10	1200	X		PRETEST C-W	1	X	X	X	X	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature) Karin A. Olsen	Date/Time 11/8/10 1630
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time 11/9/10 0915

Client:
EA Engineering Science, and Technology, Inc.

15 Loveton Circle
Sparks, MD 21152

Project Manager:
Karin Olsen

Phone: **410.329.5112**

Quote:

Project Name: Coke Point

Project#: **1453417 0008E**

Page 1 of 1

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238

phone: 412.963.2428
fax: 412.963.2468

ATTN: Carrie Gamber

Date	Time	Tissue	Sediment	Sample Identification	No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)	Remarks
11/4/2010	1200	X		AT0-649A-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-649B-C	1	X	X	X	X	X	PLEASE RUN MS/MSD ON ONE
11/4/2010	1200	X		AT0-649C-C	1	X	X	X	X	X	WORM AND ONE CLAM SAMPLE
11/4/2010	1200	X		AT0-649D-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-649E-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-650A-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-650B-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-650C-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-650D-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-650E-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-683A-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-683B-C	1	X	X	X	X	X	
11/4/2010	1200	X		AT0-683C-C	1	X	X	X	X	X	
10/6/2010	1200	X		PRETESTA-C	1	X	X	X	X	X	
10/6/2010	1200	X		PRETESTB-C	1	X	X	X	X	X	
10/6/2010	1200	X		PRETESTC-C	1	X	X	X	X	X	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature) Karin A Olsen	Date/Time 11/8/10 1630
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time 11/8/10 0915

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0K090449

Client: Maryland Environmental Service, Millersville, MD Date: December 17, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	AT0-649A-W	C0K090449-001	Tissue
1MS	AT0-649A-WMS	C0K090449-001MS	Tissue
1MSD	AT0-649A-WMSD	C0K090449-001MSD	Tissue
2	AT0-649B-W	C0K090449-002	Tissue
3	AT0-649C-W	C0K090449-003	Tissue
4	AT0-649D-W	C0K090449-004	Tissue
5	AT0-649E-W	C0K090449-005	Tissue
6	AT0-650A-W	C0K090449-006	Tissue
7	AT0-650B-W	C0K090449-007	Tissue
8	AT0-650C-W	C0K090449-008	Tissue
9	AT0-650D-W	C0K090449-009	Tissue
10	AT0-650E-W	C0K090449-010	Tissue
11	AT0-682A-W	C0K090449-011	Tissue
12	AT0-682B-W	C0K090449-012	Tissue
13	AT0-682C-W	C0K090449-013	Tissue
14	PRETEST A-W	C0K090449-014	Tissue
15	PRETEST B-W	C0K090449-015	Tissue
16	PRETEST C-W	C0K090449-016	Tissue
17	AT0-649A-C	C0K090449-017	Tissue
17MS	AT0-649A-CMS	C0K090449-017MS	Tissue
17MSD	AT0-649A-CMSD	C0K090449-017MSD	Tissue
18	AT0-649B-C	C0K090449-018	Tissue
19	AT0-649C-C	C0K090449-019	Tissue
20	AT0-649D-C	C0K090449-020	Tissue
21	AT0-649E-C	C0K090449-021	Tissue
22	AT0-650A-C	C0K090449-022	Tissue
23	AT0-650B-C	C0K090449-023	Tissue
24	AT0-650C-C	C0K090449-024	Tissue
25	AT0-650D-C	C0K090449-025	Tissue
26	AT0-650E-C	C0K090449-026	Tissue
27	AT0-683A-C	C0K090449-027	Tissue
28	AT0-683B-C	C0K090449-028	Tissue
29	AT0-683C-C	C0K090449-029	Tissue
30	PRETESTA-C	C0K090449-030	Tissue
31	PRETESTB-C	C0K090449-031	Tissue

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
32	PRETESTC-C	C0K090449-032	Tissue
33	SRM	C0K090449-033	Tissue
34	SRM	C0K090449-034	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Blank ID	Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
Batch 0320198	Chromium	0.034	0.17	B	5, 8, 11, 13
	Nickel	0.0096	0.048	None	All > 5X
Batch 0320200	Aluminum	0.59	2.95	None	All > 5X
	Chromium	0.034	0.17	None	
	Copper	0.027	0.135	None	
	Iron	3.3	16.5	None	

Field and Equipment Blank - Field QC samples were not included in this data package.

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
1	Silver	68%/68%/OK	L/UL	1-16, 18, 33
	Zinc	OK/72%/OK	L/UL	
17	Iron	72%/OK/OK	L/UL	17, 19-32, 34
	Silver	OK/74%/OK	L/UL	

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - The ICP serial dilution sample exhibited acceptable %D values.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

The laboratory used (J) flags to indicate blank contamination which the reviewer deleted since the results were not affected.

Two standard reference material (SRM) QC samples were analyzed in this data package.

EA Engineering, Science and Technology

Client Sample ID: AT0-649A-W

TOTAL Metals

Lot-Sample #...: C0K090449-001 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**46.4**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AD**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	**0.041 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AE**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0029	
Arsenic	**1.8**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AF**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.015	
Beryllium	ND	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AG
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0033	
Cadmium	**0.039 ~~B~~ J**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AH**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0080	
Chromium	**1.2 ~~B~~**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AJ**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0070	
Cobalt	**0.46**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AK**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Copper	**2.8**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AL**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0075	
Iron	**392**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QR71AM**
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649A-W

TOTAL Metals

Lot-Sample #...: C0K090449-001 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	2.7	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AN
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Manganese	6.6	0.044	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AP
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	0.44 ~~B~~	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AQ
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0060	
Selenium	0.28 ~~B~~ J	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AR
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.036	
Silver	0.036 ~~B~~ L	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AT
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Thallium	0.011 ~~B~~ J	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AU
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Tin	0.80	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AV
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.093	
Zinc	34.5 L	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QR71AW
		Dilution Factor: 0.88		Analysis Time..: 19:37	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.010	
Prep Batch #...: 0323012						
Mercury	0.023 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/19/10	L9QR71A1
		Dilution Factor: 1		Analysis Time..: 08:19	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649B-W

TOTAL Metals

Lot-Sample #...: C0K090449-002 Matrix.....: BIOLOGIC
Date Sampled...: 11/03/10 Date Received..: 11/09/10
% Moisture.....: 84

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	42.5	2.2	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AJ
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.18	
Antimony	0.036 ~~B~~ J	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AK
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0025	
Arsenic	2.0	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AL
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Beryllium	0.0039 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AM
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Cadmium	0.037 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AN
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0068	
Chromium	1.1 ~~B~~	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AP
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0060	
Cobalt	0.46	0.038	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AQ
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Copper	2.9	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AR
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0064	
Iron	371	3.8	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AT
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	

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Client Sample ID: AT0-649B-W

TOTAL Metals

Lot-Sample #...: C0K090449-002 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	2.6	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AU
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Manganese	6.7	0.038	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AV
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	
Nickel	0.42 ~~B~~	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AW
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0051	
Selenium	0.30 ~~B~~ J	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1AX
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.030	
Silver	0.041 ~~B~~ L	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1A0
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Thallium	0.012 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1A1
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0015	
Tin	0.70	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1A2
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.080	
Zinc	34.6 L	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QTT1A3
		Dilution Factor: 0.75		Analysis Time..: 20:12	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0088	
Prep Batch #...: 0323012						
Mercury	0.023 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/19/10	L9QTT1AC
		Dilution Factor: 1		Analysis Time..: 08:24	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649C-W

TOTAL Metals

Lot-Sample #...: C0K090449-003 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**12.3**	**2.3**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AJ**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.18	
Antimony	**0.015 ~~B~~ J**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AK**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0025	
Arsenic	**1.8**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AL**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Beryllium	ND	0.076	mg/kg	SW846 6020	11/16-11/21/10	L9QTV1AM
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Cadmium	**0.023 ~~B~~ J**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AN**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0069	
Chromium	**0.36 ~~J~~**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AP**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0061	
Cobalt	**0.30**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AQ**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Copper	**1.5**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AR**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0065	
Iron	**141**	**3.8**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AT**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649C-W

TOTAL Metals

Lot-Sample #...: C0K090449-003 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.73**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AU**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Manganese	**2.3**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AV**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	
Nickel	**0.33 ~~B~~**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AW**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0052	
Selenium	**0.30 ~~B~~ J**	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1AX**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.031	
Silver	**0.022 ~~B~~ L**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1A0**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Thallium	**0.0052 ~~B~~ J**	**0.076**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1A1**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0015	
Tin	**0.19 ~~B~~ J**	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1A2**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.081	
Zinc	**10.2 L**	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTV1A3**
		Dilution Factor: 0.76		Analysis Time..: 20:16	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0089	

Prep Batch #...: 0323012

Mercury	**0.017 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QTV1AC**
		Dilution Factor: 1		Analysis Time..: 08:29	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649D-W

TOTAL Metals

Lot-Sample #...: C0K090449-004 Matrix.....: BIOLOGIC
Date Sampled...: 11/03/10 Date Received..: 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**42.9**	**2.1**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AJ**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.17	
Antimony	**0.018 ~~B~~ J**	**0.14**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AK**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0023	
Arsenic	**2.0**	**0.070**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AL**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Beryllium	ND	0.070	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1AM
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Cadmium	**0.035 ~~B~~ J**	**0.070**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AN**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0064	
Chromium	**1.0 ~~B~~**	**0.14**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AP**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0056	
Cobalt	**0.49**	**0.035**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AQ**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Copper	**2.5**	**0.14**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AR**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0060	
Iron	**383**	**3.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QTW1AT**
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.20	

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Client Sample ID: AT0-649D-W

TOTAL Metals

Lot-Sample #...: C0K090449-004 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	2.7	0.070	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1AU
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0024	
Manganese	7.3	0.035	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1AV
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.010	
Nickel	0.43 ~~B~~	0.070	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1AW
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0048	
Selenium	0.36	0.35	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1AX
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.028	
Silver	0.047 ~~B~~ L	0.070	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1A0
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0017	
Thallium	0.0048 ~~B~~ J	0.070	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1A1
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0014	
Tin	0.45	0.35	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1A2
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.074	
Zinc	25.5 L	0.35	mg/kg	SW846 6020	11/16-11/21/10	L9QTW1A3
		Dilution Factor: 0.7		Analysis Time..: 20:20	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0082	

Prep Batch #...: 0323012

Mercury	0.020 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/19/10	L9QTW1AC
		Dilution Factor: 1		Analysis Time..: 08:31	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
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EA Engineering, Science and Technology

Client Sample ID: AT0-649E-W

TOTAL Metals

Lot-Sample #...: C0K090449-005 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 83

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**2.0 ~~B~~ J**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AJ**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.20	
Antimony	**0.0076 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AK**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Arsenic	**1.8**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AL**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QT01AM
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0031	
Cadmium	**0.024 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AN**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0077	
Chromium	**0.17 ~~J~~ B**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AP**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0068	
Cobalt	**0.25**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AQ**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Copper	**1.3**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AR**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0072	
Iron	**71.6**	**4.2**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AT**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649E-W

TOTAL Metals

Lot-Sample #...: C0K090449-005 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.20**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AU**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0029	
Manganese	**2.4**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AV**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Nickel	**0.26 ~~J~~**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AW**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0058	
Selenium	**0.32 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01AX**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.035	
Silver	**0.031 ~~B~~ L**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01A0**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0020	
Thallium	**0.0031 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01A1**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0017	
Tin	ND	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QT01A2
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.090	
Zinc	**37.6 L**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT01A3**
		Dilution Factor: 0.85		Analysis Time..: 20:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0099	

Prep Batch #...: 0323012

Mercury	**0.016 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QT01AC**
		Dilution Factor: 1		Analysis Time..: 08:33	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650A-W

TOTAL Metals

Lot-Sample #...: C0K090449-006 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 83

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**0.61 ~~B~~ J**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AJ**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	**0.0052 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AK**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0029	
Arsenic	**2.5**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AL**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.014	
Beryllium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QT11AM
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0032	
Cadmium	**0.044 ~~B~~ J**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AN**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0079	
Chromium	**0.20 ~~B~~**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AP**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0070	
Cobalt	**0.092**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AQ**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Copper	**1.3**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AR**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0074	
Iron	**66.7**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AT**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.25	

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Client Sample ID: AT0-650A-W

TOTAL Metals

Lot-Sample #...: C0K090449-006 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.076 ~~B~~ J**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AU**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Manganese	**1.6**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AV**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.23 ~~J~~**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AW**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0059	
Selenium	**0.40 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11AX**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.035	
Silver	**0.026 ~~B~~ L**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11A0**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Thallium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QT11A1
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0017	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QT11A2
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.092	
Zinc	**37.3 L**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT11A3**
		Dilution Factor: 0.87		Analysis Time..: 20:29	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.010	

Prep Batch #...: 0323012

Mercury	**0.025 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QT11AC**
		Dilution Factor: 1		Analysis Time..: 08:35	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650B-W

TOTAL Metals

Lot-Sample #...: C0K090449-007 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	1.2 ~~B~~ J	2.7	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AJ
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	0.0061 ~~B~~ J	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AK
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Arsenic	2.4	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AL
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AM
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0034	
Cadmium	0.031 ~~B~~ J	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AN
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0083	
Chromium	0.22 ~~B~~	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AP
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0073	
Cobalt	0.098	0.046	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AQ
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0023	
Copper	1.4	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AR
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0077	
Iron	62.8	4.6	mg/kg	SW846 6020	11/16-11/21/10	L9QT31AT
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.26	

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Client Sample ID: AT0-650B-W

TOTAL Metals

Lot-Sample #...: C0K090449-007 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.081 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31AU**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0031	
Manganese	**1.1**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31AV**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.23 ~~B~~**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31AW**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0062	
Selenium	**0.29 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31AX**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.037	
Silver	**0.027 ~~B~~ L**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31A0**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Thallium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QT31A1
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	11/16-11/21/10	L9QT31A2
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.096	
Zinc	**33.0 L**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT31A3**
		Dilution Factor: 0.91		Analysis Time..: 20:33	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	

Prep Batch #...: 0323012

Mercury	**0.027 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QT31AC**
		Dilution Factor: 1		Analysis Time..: 08:36	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MJ
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EA Engineering, Science and Technology

Client Sample ID: AT0-650C-W

TOTAL Metals

Lot-Sample #...: C0K090449-008 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**0.41 ~~B~~ J**	**2.3**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AJ**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.18	
Antimony	**0.0042 ~~B~~ J**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AK**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0025	
Arsenic	**2.2**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AL**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Beryllium	ND	0.077	mg/kg	SW846 6020	11/16-11/21/10	L9QT51AM
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Cadmium	**0.038 ~~B~~ J**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AN**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0070	
Chromium	**0.17 ~~B~~ B**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AP**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0062	
Cobalt	**0.082**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AQ**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Copper	**1.2**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AR**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0065	
Iron	**60.4**	**3.8**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AT**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	

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EA Engineering, Science and Technology

Client Sample ID: AT0-650C-W

TOTAL Metals

Lot-Sample #...: C0K090449-008 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.11**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AU**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Manganese	**0.45**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AV**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	
Nickel	**0.22** ~~J~~	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AW**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0052	
Selenium	**0.28** ~~B~~ J	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51AX**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.031	
Silver	**0.024** ~~B~~ L	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51A0**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Thallium	ND	0.077	mg/kg	SW846 6020	11/16-11/21/10	L9QT51A1
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0015	
Tin	ND	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QT51A2
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.082	
Zinc	**9.1** L	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT51A3**
		Dilution Factor: 0.77		Analysis Time..: 20:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0090	

Prep Batch #...: 0323012

Mercury	**0.025** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QT51AC**
		Dilution Factor: 1		Analysis Time..: 08:38	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650D-W

TOTAL Metals

Lot-Sample #...: C0K090449-009 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**1.0 ~~B~~ J**	**2.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AJ**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.19	
Antimony	**0.0051 ~~B~~ J**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AK**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0027	
Arsenic	**2.3**	**0.081**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AL**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Beryllium	ND	0.081	mg/kg	SW846 6020	11/16-11/21/10	L9QT61AM
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Cadmium	**0.043 ~~B~~ J**	**0.081**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AN**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0074	
Chromium	**0.20 ~~J~~**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AP**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0065	
Cobalt	**0.093**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AQ**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0020	
Copper	**1.3**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AR**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0069	
Iron	**62.2**	**4.0**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AT**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.23	

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Client Sample ID: AT0-650D-W

TOTAL Metals

Lot-Sample #...: C0K090449-009 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.96**	**0.081**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AU**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Manganese	**0.98**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AV**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Nickel	**0.24** ~~B~~	**0.081**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AW**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0055	
Selenium	**0.35** ~~B~~ J	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61AX**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.033	
Silver	**0.025** ~~B~~ L	**0.081**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61A0**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Thallium	ND	0.081	mg/kg	SW846 6020	11/16-11/21/10	L9QT61A1
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0016	
Tin	ND	0.40	mg/kg	SW846 6020	11/16-11/21/10	L9QT61A2
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.086	
Zinc	**26.7** L	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QT61A3**
		Dilution Factor: 0.81		Analysis Time..: 20:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0095	

Prep Batch #...: 0323012

Mercury	**0.022** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QT61AC**
		Dilution Factor: 1		Analysis Time..: 08:40	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: AT0-650E-W

TOTAL Metals

Lot-Sample #...: C0K090449-010 Matrix.....: BIOLOGIC
Date Sampled...: 11/03/10 Date Received..: 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	2.3 ~~B~~ J	2.7	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AJ
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	0.0054 ~~B~~ J	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AK
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Arsenic	2.3	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AL
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AM
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0034	
Cadmium	0.033 ~~B~~ J	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AN
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0083	
Chromium	0.79 ~~B~~	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AP
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0073	
Cobalt	0.088	0.046	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AQ
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0023	
Copper	1.3	0.18	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AR
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0077	
Iron	63.0	4.6	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1AT
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.26	

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Client Sample ID: AT0-650E-W

TOTAL Metals

Lot-Sample #...: C0K090449-010 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.14**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1AU**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0031	
Manganese	**1.2**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1AV**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.27 ~~J~~**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1AW**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0062	
Selenium	**0.28 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1AX**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.037	
Silver	**0.017 ~~B~~ L**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1A0**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Thallium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1A1
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	11/16-11/21/10	L9QVC1A2
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.096	
Zinc	**39.5 L**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVC1A3**
		Dilution Factor: 0.91		Analysis Time..: 20:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	

Prep Batch #...: 0323012

Mercury	**0.024 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVC1AC**
		Dilution Factor: 1		Analysis Time..: 08:41	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-682A-W

TOTAL Metals

Lot-Sample #...: C0K090449-011 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 86

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**7.7**	**2.8**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AJ**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	
Antimony	**0.047 ~~B~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AK**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0031	
Arsenic	**2.3**	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AL**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	11/16-11/21/10	L9QVE1AM
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0034	
Cadmium	**0.017 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AN**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0085	
Chromium	**0.16 ~~B~~ J B**	**0.19**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AP**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0074	
Cobalt	**0.10**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AQ**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0023	
Copper	**1.4**	**0.19**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AR**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0079	
Iron	**74.9**	**4.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AT**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.27	

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EA Engineering, Science and Technology

Client Sample ID: AT0-682A-W

TOTAL Metals

Lot-Sample #...: C0K090449-011 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.17**	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AU**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0032	
Manganese	**0.84**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AV**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.15** ~~B~~	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AW**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0063	
Selenium	**0.26** ~~B~~ J	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1AX**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.038	
Silver	**0.038** ~~B~~ L	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1A0**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Thallium	**0.0023** ~~B~~ J	**0.093**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1A1**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Tin	ND	0.46	mg/kg	SW846 6020	11/16-11/21/10	L9QVE1A2
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.099	
Zinc	**22.0** L	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVE1A3**
		Dilution Factor: 0.93		Analysis Time..: 21:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	

Prep Batch #...: 0323012

Mercury	**0.023** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVE1AC**
		Dilution Factor: 1		Analysis Time..: 08:44	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: AT0-682B-W

TOTAL Metals

Lot-Sample #...: C0K090449-012 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**7.4**	**2.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AJ**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.20	
Antimony	**0.012 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AK**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0027	
Arsenic	**2.0**	**0.083**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AL**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.014	
Beryllium	ND	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QVJ1AM
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0031	
Cadmium	ND	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QVJ1AN
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0076	
Chromium	**0.19 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AP**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0066	
Cobalt	**0.087**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AQ**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Copper	**1.1**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AR**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0071	
Iron	**69.8**	**4.2**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AT**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.24	

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Client Sample ID: AT0-682B-W

TOTAL Metals

Lot-Sample #...: C0K090449-012 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.26**	**0.083**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AU**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Manganese	**0.48**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AV**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Nickel	**0.14** ~~B~~	**0.083**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AW**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0056	
Selenium	**0.22** ~~B~~ J	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1AX**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.034	
Silver	**0.028** ~~B~~ L	**0.083**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1A0**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0020	
Thallium	ND	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QVJ1A1
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0017	
Tin	ND	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QVJ1A2
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.088	
Zinc	**7.7** L	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVJ1A3**
		Dilution Factor: 0.83		Analysis Time..: 21:09	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0097	

Prep Batch #...: 0323012

Mercury	**0.020** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVJ1AC**
		Dilution Factor: 1		Analysis Time..: 08:45	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-682C-W

TOTAL Metals

Lot-Sample #...: C0K090449-013 Matrix.....: BIOLOGIC
Date Sampled...: 11/03/10 Date Received..: 11/09/10
% Moisture.....: 84

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	1.4 ~~B~~ J	2.4	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AJ
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.19	
Antimony	0.0069 ~~B~~ J	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AK
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Arsenic	2.2	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AL
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Beryllium	ND	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AM
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Cadmium	0.014 ~~B~~ J	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AN
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0073	
Chromium	0.14 ~~B J~~ B	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AP
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0064	
Cobalt	0.10	0.040	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AQ
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0020	
Copper	0.99	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AR
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0068	
Iron	60.4	4.0	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1AT
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.23	

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EA Engineering, Science and Technology

Client Sample ID: AT0-682C-W

TOTAL Metals

Lot-Sample #...: C0K090449-013 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.45**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1AU**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0027	
Manganese	**1.6**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1AV**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Nickel	**0.17 ~~B~~**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1AW**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0054	
Selenium	**0.30 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1AX**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.032	
Silver	**0.027 ~~B~~ L**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1A0**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Thallium	ND	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1A1
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0016	
Tin	ND	0.40	mg/kg	SW846 6020	11/16-11/21/10	L9QVM1A2
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.085	
Zinc	**48.7 L**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVM1A3**
		Dilution Factor: 0.8		Analysis Time..: 21:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0094	

Prep Batch #...: 0323012

Mercury	**0.020 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVM1AC**
		Dilution Factor: 1		Analysis Time..: 08:50	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PRETEST A-W

TOTAL Metals

Lot-Sample #...: C0K090449-014 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**151**	**2.7**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AJ**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	**0.0069 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AK**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0029	
Arsenic	**2.3**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AL**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.015	
Beryllium	**0.0050 ~~B~~ J**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AM**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0033	
Cadmium	ND	0.089	mg/kg	SW846 6020	11/16-11/21/10	L9QVP1AN
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0081	
Chromium	**0.70 ~~B~~**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AP**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0071	
Cobalt	**0.19**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AQ**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Copper	**1.4**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AR**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0076	
Iron	**356**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AT**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.26	

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Client Sample ID: PRETEST A-W

TOTAL Metals

Lot-Sample #...: C0K090449-014 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**1.3**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AU**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Manganese	**5.7**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AV**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.47** ~~J~~	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AW**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0061	
Selenium	**0.22** ~~B~~ J	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1AX**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.036	
Silver	**0.034** ~~B~~ L	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1A0**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Thallium	**0.0021** ~~B~~ J	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1A1**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QVP1A2
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.094	
Zinc	**9.8** L	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVP1A3**
		Dilution Factor: 0.89		Analysis Time..: 21:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.010	

Prep Batch #...: 0323012

Mercury	**0.018** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVP1AC**
		Dilution Factor: 1		Analysis Time..: 08:52	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PRETEST B-W

TOTAL Metals

Lot-Sample #...: C0K090449-015 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 84

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**246**	**2.3**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AJ**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.18	
Antimony	**0.0064 ~~B~~ J**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AK**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0025	
Arsenic	**1.9**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AL**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Beryllium	**0.0097 ~~B~~ J**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AM**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Cadmium	**0.020 ~~B~~ J**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AN**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0070	
Chromium	**0.93 ~~B~~**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AP**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0062	
Cobalt	**0.23**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AQ**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Copper	**1.3**	**0.15**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AR**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0065	
Iron	**505**	**3.8**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AT**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	

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EA Engineering, Science and Technology

Client Sample ID: PRETEST B-W

TOTAL Metals

Lot-Sample #...: C0K090449-015 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**5.2**	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AU**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Manganese	**8.2**	**0.038**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AV**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	
Nickel	**0.61** ~~J~~	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AW**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0052	
Selenium	**0.24** ~~B~~ J	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1AX**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.031	
Silver	**0.023** ~~B~~ L	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1A0**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Thallium	**0.0050** ~~B~~ J	**0.077**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1A1**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0015	
Tin	ND	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QVT1A2
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.082	
Zinc	**8.3** L	**0.38**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QVT1A3**
		Dilution Factor: 0.77		Analysis Time..: 21:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0090	

Prep Batch #...: 0323012

Mercury	**0.013** ~~B~~ J	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QVT1AC**
		Dilution Factor: 1		Analysis Time..: 08:54	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PRETEST C-W

TOTAL Metals

Lot-Sample #...: C0K090449-016 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/03/10 **Date Received..:** 11/09/10
% Moisture.....: 85

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	154	2.2	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AJ
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.18	
Antimony	0.0057 ~~B~~ J	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AK
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0025	
Arsenic	2.2	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AL
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.012	
Beryllium	0.0076 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AM
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0028	
Cadmium	0.011 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AN
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0068	
Chromium	0.68 ~~J~~	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AP
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0060	
Cobalt	0.18	0.038	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AQ
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0019	
Copper	1.5	0.15	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AR
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0064	
Iron	356	3.8	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AT
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.22	

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EA Engineering, Science and Technology

Client Sample ID: PRETEST C-W

TOTAL Metals

Lot-Sample #...: C0K090449-016 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	7.3	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AU
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0026	
Manganese	5.9	0.038	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AV
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	
Nickel	0.47 ~~B~~	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AW
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0051	
Selenium	0.21 ~~B~~ J	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1AX
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.030	
Silver	0.060 ~~B~~ L	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1A0
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0018	
Thallium	0.0068 ~~B~~ J	0.075	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1A1
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0015	
Tin	ND	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1A2
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.080	
Zinc	9.0 L	0.38	mg/kg	SW846 6020	11/16-11/21/10	L9QVW1A3
		Dilution Factor: 0.75		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0088	
Prep Batch #...: 0323012						
Mercury	0.019 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/19/10	L9QVW1AC
		Dilution Factor: 1		Analysis Time..: 08:56	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649A-C

TOTAL Metals

Lot-Sample #...: C0K090449-017 Matrix.....: BIOLOGIC
Date Sampled...: 11/04/10 Date Received..: 11/09/10
% Moisture.....: 90

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	13.2 ~~J~~	2.4	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AD
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.19	
Antimony	0.048 ~~B~~ J	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AE
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0026	
Arsenic	2.7	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AF
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Beryllium	ND	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AG
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Cadmium	0.035 ~~B~~ J	0.080	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AH
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0073	
Chromium	0.36 ~~J~~	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AJ
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0064	
Cobalt	0.35	0.040	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AK
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Copper	1.8 ~~B~~	0.16	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AL
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0068	
Iron	174 ~~J~~ L	4.0	mg/kg	SW846 6020	11/16-11/21/10	L9QV21AM
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.23	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649A-C

TOTAL Metals

Lot-Sample #...: C0K090449-017 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.87**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AN**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0027	
Manganese	**2.6**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AP**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	**0.40**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AQ**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0054	
Selenium	**0.31 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AR**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.032	
Silver	**0.027 ~~B~~ L**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AT**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0019	
Thallium	**0.0039 ~~B~~ J**	**0.080**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AU**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0016	
Tin	**0.27 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AV**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.085	
Zinc	**13.4**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV21AW**
		Dilution Factor: 0.8		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0094	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV21A1
		Dilution Factor: 1		Analysis Time..: 09:02	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

KW
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EA Engineering, Science and Technology

Client Sample ID: AT0-649B-C

TOTAL Metals

Lot-Sample #...: C0K090449-018 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 89

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	**13.9**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AJ**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.21	
Antimony	**0.013 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AK**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0029	
Arsenic	**2.1**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AL**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.014	
Beryllium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QV41AM
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0032	
Cadmium	**0.030 ~~B~~ J**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AN**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0079	
Chromium	**0.53 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AP**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0070	
Cobalt	**0.28**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AQ**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0022	
Copper	**2.1**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AR**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0074	
Iron	**182**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AT**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649B-C

TOTAL Metals

Lot-Sample #...: C0K090449-018 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**1.1**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AU**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0030	
Manganese	**2.1**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AV**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.013	
Nickel	**0.36 ~~J~~**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AW**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0059	
Selenium	**0.28 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41AX**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.035	
Silver	**0.030 ~~B~~ L**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41A0**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0021	
Thallium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QV41A1
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0017	
Tin	**0.14 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41A2**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.092	
Zinc	**12.5 L**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV41A3**
		Dilution Factor: 0.87		Analysis Time..: 21:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.010	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV41AC
		Dilution Factor: 1		Analysis Time..: 09:11	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

KW
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EA Engineering, Science and Technology

Client Sample ID: AT0-649C-C

TOTAL Metals

Lot-Sample #...: C0K090449-019 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 90

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	13.2 ~~J~~	2.6	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AJ
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.20	
Antimony	0.038 ~~B~~ J	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AK
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Arsenic	2.3	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AL
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AM
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Cadmium	0.042 ~~B~~ J	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AN
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0077	
Chromium	0.41 ~~J~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AP
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0068	
Cobalt	0.33	0.042	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AQ
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Copper	2.1 ~~J~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AR
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0072	
Iron	173 ~~J~~ L	4.2	mg/kg	SW846 6020	11/16-11/21/10	L9QV61AT
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649C-C

TOTAL Metals

Lot-Sample #...: C0K090449-019 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.98**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61AU**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Manganese	**1.9**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61AV**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	**0.37**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61AW**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0058	
Selenium	**0.26 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61AX**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.035	
Silver	**0.033 ~~B~~ L**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61A0**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	**0.012 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61A1**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	**0.48**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61A2**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.090	
Zinc	**13.8**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV61A3**
		Dilution Factor: 0.85		Analysis Time..: 22:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0099	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV61AC
		Dilution Factor: 1		Analysis Time..: 09:12	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649D-C

TOTAL Metals

Lot-Sample #...: C0K090449-020 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 91

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	12.5 ~~B~~	2.6	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AJ
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.20	
Antimony	0.034 ~~B~~ J	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AK
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Arsenic	2.5	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AL
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AM
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Cadmium	0.026 ~~B~~ J	0.085	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AN
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0077	
Chromium	0.41 ~~B~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AP
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0068	
Cobalt	0.31	0.042	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AQ
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Copper	2.2 ~~B~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AR
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0072	
Iron	164 ~~B~~ L	4.2	mg/kg	SW846 6020	11/16-11/21/10	L9QV71AT
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649D-C

TOTAL Metals

Lot-Sample #...: C0K090449-020 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**1.0**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71AU**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Manganese	**2.1**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71AV**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	**0.40**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71AW**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0058	
Selenium	**0.32 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71AX**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.035	
Silver	**0.040 ~~B~~ L**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71A0**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	**0.0077 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71A1**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	**0.25 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71A2**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.090	
Zinc	**15.3**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV71A3**
		Dilution Factor: 0.85		Analysis Time..: 22:28	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0099	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV71AC
		Dilution Factor: 1		Analysis Time..: 09:14	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649E-C

TOTAL Metals

Lot-Sample #...: C0K090449-021 Matrix.....: BIOLOGIC
Date Sampled...: 11/04/10 Date Received..: 11/09/10
% Moisture.....: 88

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	14.9 ~~J~~	2.5	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AJ
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.20	
Antimony	0.021 ~~B~~ J	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AK
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0027	
Arsenic	2.9	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AL
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AM
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Cadmium	0.028 ~~B~~ J	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AN
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0076	
Chromium	0.47 ~~J~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AP
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0066	
Cobalt	0.33	0.042	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AQ
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Copper	2.2 ~~J~~	0.17	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AR
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0071	
Iron	210 ~~J~~ L	4.2	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AT
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.24	

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EA Engineering, Science and Technology

Client Sample ID: AT0-649E-C

TOTAL Metals

Lot-Sample #...: C0K090449-021 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	1.4	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AU
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Manganese	2.6	0.042	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AV
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	0.43	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AW
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0056	
Selenium	0.35 ~~B~~ J	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QV81AX
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.034	
Silver	0.030 ~~B~~ L	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81A0
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	0.0044 ~~B~~ J	0.083	mg/kg	SW846 6020	11/16-11/21/10	L9QV81A1
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	0.19 ~~B~~ J	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QV81A2
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.088	
Zinc	15.2	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QV81A3
		Dilution Factor: 0.83		Analysis Time..: 22:32	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0097	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV81AC
		Dilution Factor: 1		Analysis Time..: 09:16	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650A-C

TOTAL Metals

Lot-Sample #...: C0K090449-022 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 89

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**12.2** ~~J~~	**2.7**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AJ**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.018** ~~B~~ J	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AK**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Arsenic	**2.3**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AL**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.015	
Beryllium	ND	0.089	mg/kg	SW846 6020	11/16-11/21/10	L9QV91AM
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0033	
Cadmium	**0.036** ~~B~~ J	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AN**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0081	
Chromium	**0.31** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AP**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0071	
Cobalt	**0.13**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AQ**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Copper	**1.6** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AR**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0076	
Iron	**73.9** ~~J~~ L	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AT**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: AT0-650A-C

TOTAL Metals

Lot-Sample #...: C0K090449-022 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.19**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AU**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Manganese	**1.7**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AV**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.37**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AW**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0061	
Selenium	**0.13 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91AX**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.036	
Silver	**0.029 ~~B~~ L**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91A0**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Thallium	**0.0039 ~~B~~ J**	**0.089**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91A1**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0018	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QV91A2
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.094	
Zinc	**10.9**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QV91A3**
		Dilution Factor: 0.89		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.010	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QV91AC
		Dilution Factor: 1		Analysis Time..: 09:18	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650B-C

TOTAL Metals

Lot-Sample #...: C0K090449-023 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 92

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**9.2** ~~J~~	**2.7**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AJ**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.018** ~~B~~ J	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AK**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Arsenic	**2.1**	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AL**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.015	
Beryllium	ND	0.090	mg/kg	SW846 6020	11/16-11/21/10	L9QWA1AM
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0033	
Cadmium	**0.038** ~~B~~ J	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AN**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0082	
Chromium	**0.35** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AP**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0072	
Cobalt	**0.13**	**0.045**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AQ**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Copper	**2.0** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AR**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0076	
Iron	**74.3** ~~J~~ L	**4.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AT**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.26	

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Client Sample ID: AT0-650B-C

TOTAL Metals

Lot-Sample #...: C0K090449-023 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.51**	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AU**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Manganese	**1.4**	**0.045**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AV**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.32**	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AW**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0061	
Selenium	**0.16 ~~B~~ J**	**0.45**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1AX**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.037	
Silver	**0.045 ~~B~~ L**	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1A0**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Thallium	**0.0038 ~~B~~ J**	**0.090**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1A1**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0018	
Tin	**0.11 ~~B~~ J**	**0.45**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1A2**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.095	
Zinc	**11.1**	**0.45**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWA1A3**
		Dilution Factor: 0.9		Analysis Time..: 22:41	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.011	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWA1AC
		Dilution Factor: 1		Analysis Time..: 09:19	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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Client Sample ID: AT0-650C-C

TOTAL Metals

Lot-Sample #...: C0K090449-024 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 90

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**10.5** ~~B~~	**2.7**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AJ**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.017** ~~B~~ J	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AK**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Arsenic	**2.8**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AL**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QWC1AM
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0034	
Cadmium	**0.058** ~~B~~ J	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AN**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0083	
Chromium	**0.30** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AP**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0073	
Cobalt	**0.19**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AQ**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0023	
Copper	**2.4** ~~J~~	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AR**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0077	
Iron	**77.0** ~~J~~ L	**4.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AT**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.26	

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Client Sample ID: AT0-650C-C

TOTAL Metals

Lot-Sample #...: C0K090449-024 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.24**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AU**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Manganese	**1.8**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AV**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.43**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AW**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0062	
Selenium	**0.23 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1AX**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.037	
Silver	**0.046 ~~B~~ L**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1A0**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Thallium	**0.0034 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1A1**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	11/16-11/21/10	L9QWC1A2
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.096	
Zinc	**16.5**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWC1A3**
		Dilution Factor: 0.91		Analysis Time..: 22:45	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.011	

Prep Batch #...: 0323013

Mercury	**0.012 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9QWC1AC**
		Dilution Factor: 1		Analysis Time..: 09:21	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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Client Sample ID: AT0-650D-C

TOTAL Metals

Lot-Sample #...: C0K090449-025 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 90

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**12.3 ~~J~~**	**2.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AJ**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.19	
Antimony	**0.046 ~~B~~ J**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AK**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0027	
Arsenic	**2.1**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AL**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1AM
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Cadmium	**0.035 ~~B~~ J**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AN**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0075	
Chromium	**0.27 ~~J~~**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AP**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0066	
Cobalt	**0.17**	**0.041**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AQ**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Copper	**1.5 ~~J~~**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AR**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0070	
Iron	**75.2 ~~J~~ L**	**4.1**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWE1AT**
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.24	

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Client Sample ID: AT0-650D-C

TOTAL Metals

Lot-Sample #...: C0K090449-025 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.17	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1AU
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Manganese	1.5	0.041	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1AV
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	0.37	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1AW
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0056	
Selenium	0.19 ~~B~~ J	0.41	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1AX
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.033	
Silver	0.024 B L	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1A0
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	0.0034 ~~B~~ J	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1A1
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0016	
Tin	0.11 ~~B~~ J	0.41	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1A2
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.087	
Zinc	10.9	0.41	mg/kg	SW846 6020	11/16-11/21/10	L9QWE1A3
		Dilution Factor: 0.82		Analysis Time..: 23:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0096	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWE1AC
		Dilution Factor: 1		Analysis Time..: 09:23	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650E-C

TOTAL Metals

Lot-Sample #...: C0K090449-026 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 91

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**29.2 J**	**2.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AJ**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.19	
Antimony	**0.024 ~~B~~ J**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AK**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0027	
Arsenic	**2.5**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AL**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.082	mg/kg	SW846 6020	11/16-11/21/10	L9QWF1AM
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Cadmium	**0.034 ~~B~~ J**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AN**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0075	
Chromium	**0.93 J**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AP**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0066	
Cobalt	**0.16**	**0.041**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AQ**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Copper	**3.3 J**	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AR**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0070	
Iron	**110 J L**	**4.1**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AT**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.24	

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EA Engineering, Science and Technology

Client Sample ID: AT0-650E-C

TOTAL Metals

Lot-Sample #...: C0K090449-026 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.20**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AU**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Manganese	**2.1**	**0.041**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AV**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	**0.50**	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AW**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0056	
Selenium	**0.25** ~~B~~ J	**0.41**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1AX**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.033	
Silver	**0.043** ~~B~~ L	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1A0**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	**0.0034** ~~B~~ J	**0.082**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1A1**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0016	
Tin	ND	0.41	mg/kg	SW846 6020	11/16-11/21/10	L9QWF1A2
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.087	
Zinc	**11.0**	**0.41**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWF1A3**
		Dilution Factor: 0.82		Analysis Time..: 23:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0096	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWF1AC
		Dilution Factor: 1		Analysis Time..: 09:24	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: AT0-683A-C

TOTAL Metals

Lot-Sample #...: C0K090449-027 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 89

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**15.9** ~~J~~	**2.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AJ**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.19	
Antimony	**0.017** ~~B~~ J	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AK**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0026	
Arsenic	**2.7**	**0.079**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AL**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Beryllium	ND	0.079	mg/kg	SW846 6020	11/16-11/21/10	L9QWG1AM
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Cadmium	**0.039** ~~B~~ J	**0.079**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AN**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0072	
Chromium	**0.25** ~~J~~	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AP**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0063	
Cobalt	**0.20**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AQ**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Copper	**2.6** ~~J~~	**0.16**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AR**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0067	
Iron	**114** ~~J~~ L	**4.0**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AT**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.23	

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EA Engineering, Science and Technology

Client Sample ID: AT0-683A-C

TOTAL Metals

Lot-Sample #...: C0K090449-027 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.13**	**0.079**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AU**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0027	
Manganese	**0.82**	**0.040**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AV**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.011	
Nickel	**0.47**	**0.079**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AW**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0054	
Selenium	**0.18 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1AX**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.032	
Silver	**0.024 ~~B~~ L**	**0.079**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1A0**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0019	
Thallium	ND	0.079	mg/kg	SW846 6020	11/16-11/21/10	L9QWG1A1
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0016	
Tin	ND	0.40	mg/kg	SW846 6020	11/16-11/21/10	L9QWG1A2
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.084	
Zinc	**11.6**	**0.40**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWG1A3**
		Dilution Factor: 0.79		Analysis Time..: 23:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0092	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWG1AC
		Dilution Factor: 1		Analysis Time..: 09:26	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-683B-C

TOTAL Metals

Lot-Sample #...: C0K090449-028 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 89

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**15.5 J**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AJ**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.013 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AK**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Arsenic	**2.8**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AL**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QWH1AM
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0032	
Cadmium	**0.046 ~~B~~ J**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AN**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0079	
Chromium	**0.25 J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AP**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0070	
Cobalt	**0.18**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AQ**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Copper	**2.2 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AR**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0074	
Iron	**111 ~~J~~ L**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AT**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.25	

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Client Sample ID: AT0-683B-C

TOTAL Metals

Lot-Sample #...: C0K090449-028 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.17**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AU**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Manganese	**0.96**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AV**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.43**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AW**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0059	
Selenium	**0.25 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1AX**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.035	
Silver	**0.044 ~~B~~ L**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1A0**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Thallium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QWH1A1
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QWH1A2
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.092	
Zinc	**14.2**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWH1A3**
		Dilution Factor: 0.87		Analysis Time..: 23:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.010	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWH1AC
		Dilution Factor: 1		Analysis Time..: 09:31	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-683C-C

TOTAL Metals

Lot-Sample #...: C0K090449-029 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 93

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**10.9 J**	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AJ**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.0099 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AK**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Arsenic	**2.3**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AL**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.015	
Beryllium	ND	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QWJ1AM
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0033	
Cadmium	**0.034 ~~B~~ J**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AN**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0080	
Chromium	**0.22 ~~B~~**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AP**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0070	
Cobalt	**0.17**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AQ**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Copper	**1.6 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AR**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0075	
Iron	**106 J L**	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AT**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.25	

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EA Engineering, Science and Technology

Client Sample ID: AT0-683C-C

TOTAL Metals

Lot-Sample #...: C0K090449-029 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.16**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AU**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Manganese	**0.60**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AV**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.43**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AW**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0060	
Selenium	**0.19 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1AX**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.036	
Silver	**0.034 ~~B~~ L**	**0.088**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1A0**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Thallium	ND	0.088	mg/kg	SW846 6020	11/16-11/21/10	L9QWJ1A1
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0018	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QWJ1A2
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.093	
Zinc	**11.4**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWJ1A3**
		Dilution Factor: 0.88		Analysis Time..: 23:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.010	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWJ1AC
		Dilution Factor: 1		Analysis Time..: 09:33	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: PRETESTA-C

TOTAL Metals

Lot-Sample #...: C0K090449-030 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 88

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**10.2 ~~J~~**	**2.5**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AJ**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.20	
Antimony	**0.014 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AK**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0028	
Arsenic	**3.0**	**0.084**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AL**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.084	mg/kg	SW846 6020	11/16-11/21/10	L9QWK1AM
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Cadmium	**0.049 ~~B~~ J**	**0.084**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AN**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0076	
Chromium	**0.20 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AP**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0067	
Cobalt	**0.19**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AQ**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Copper	**2.1 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AR**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0071	
Iron	**80.0 ~~J~~ L**	**4.2**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AT**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.24	

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EA Engineering, Science and Technology

Client Sample ID: PRETESTA-C

TOTAL Metals

Lot-Sample #...: C0K090449-030 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.11**	**0.084**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AU**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Manganese	**0.67**	**0.042**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AV**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.012	
Nickel	**0.51**	**0.084**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AW**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0057	
Selenium	**0.29 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1AX**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.034	
Silver	**0.029 ~~B~~ L**	**0.084**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1A0**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Thallium	ND	0.084	mg/kg	SW846 6020	11/16-11/21/10	L9QWK1A1
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	ND	0.42	mg/kg	SW846 6020	11/16-11/21/10	L9QWK1A2
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.089	
Zinc	**17.3**	**0.42**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWK1A3**
		Dilution Factor: 0.84		Analysis Time..: 23:26	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0098	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWK1AC
		Dilution Factor: 1		Analysis Time..: 09:35	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: PRETESTB-C

TOTAL Metals

Lot-Sample #...: C0K090449-031 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 88

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**5.3 J**	**2.7**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AJ**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.012 B J**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AK**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Arsenic	**2.6**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AL**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QWL1AM
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0034	
Cadmium	**0.034 B J**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AN**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0083	
Chromium	**0.21 B**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AP**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0073	
Cobalt	**0.16**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AQ**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0023	
Copper	**1.7 B**	**0.18**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AR**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0077	
Iron	**64.1 J L**	**4.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AT**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: PRETESTB-C

TOTAL Metals

Lot-Sample #...: C0K090449-031 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.096**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AU**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0031	
Manganese	**0.55**	**0.046**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AV**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.42**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AW**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0062	
Selenium	**0.19 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1AX**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.037	
Silver	**0.033 ~~B~~ L**	**0.091**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1A0**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Thallium	ND	0.091	mg/kg	SW846 6020	11/16-11/21/10	L9QWL1A1
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	11/16-11/21/10	L9QWL1A2
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.096	
Zinc	**12.9**	**0.46**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWL1A3**
		Dilution Factor: 0.91		Analysis Time..: 23:30	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.011	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWL1AC
		Dilution Factor: 1		Analysis Time..: 09:36	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: PRETESTC-C

TOTAL Metals

Lot-Sample #...: C0K090449-032 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....: 86

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**4.6** ~~J~~	**2.6**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AJ**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.21	
Antimony	**0.013** ~~B~~ J	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AK**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0029	
Arsenic	**2.8**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AL**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Beryllium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QWP1AM
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0032	
Cadmium	**0.046** ~~B~~ J	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AN**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0079	
Chromium	**0.19** ~~J~~	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AP**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0070	
Cobalt	**0.19**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AQ**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0022	
Copper	**1.4** ~~J~~	**0.17**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AR**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0074	
Iron	**75.1** ~~J~~ L	**4.4**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AT**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.25	

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Client Sample ID: PRETESTC-C

TOTAL Metals

Lot-Sample #...: C0K090449-032 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.10**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AU**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0030	
Manganese	**0.58**	**0.044**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AV**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.013	
Nickel	**0.46**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AW**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0059	
Selenium	**0.23 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1AX**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.035	
Silver	**0.020 ~~B~~ L**	**0.087**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1A0**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0021	
Thallium	ND	0.087	mg/kg	SW846 6020	11/16-11/21/10	L9QWP1A1
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0017	
Tin	ND	0.44	mg/kg	SW846 6020	11/16-11/21/10	L9QWP1A2
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.092	
Zinc	**15.5**	**0.44**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9QWP1A3**
		Dilution Factor: 0.87		Analysis Time..: 23:35	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.010	

Prep Batch #...: 0323013

Mercury	ND	0.033	mg/kg	SW846 7471A	11/19/10	L9QWP1AC
		Dilution Factor: 1		Analysis Time..: 09:38	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

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Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

TOTAL Metals

Lot-Sample #...: C0K090449-033 Matrix.....: BIOLOGIC
Date Sampled...: 11/04/10 Date Received..: 11/09/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320198						
Aluminum	4200	2.9	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AD
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.23	
Antimony	0.066 ~~B~~ J	0.20	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AE
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0032	
Arsenic	4.3	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AF
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.016	
Beryllium	0.24	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AG
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0036	
Cadmium	0.16	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AH
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0089	
Chromium	16.2 ~~J~~	0.20	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AJ
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0078	
Cobalt	2.9	0.049	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AK
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0024	
Copper	8.0	0.20	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AL
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0083	
Iron	12900	4.9	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AM
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.28	

(Continued on next page)

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

TOTAL Metals

Lot-Sample #...: C0K090449-033 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**7.2**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AN**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0033	
Manganese	**88.4**	**0.049**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AP**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.014	
Nickel	**15.6 ~~J~~**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AQ**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0067	
Selenium	ND	0.49	mg/kg	SW846 6020	11/16-11/21/10	L9RJP1AR
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.040	
Silver	**0.044 ~~B~~ L**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AT**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0024	
Thallium	**0.072 ~~B~~ J**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AU**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.0020	
Tin	**0.66**	**0.49**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AV**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.10	
Zinc	**31.2 L**	**0.49**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJP1AW**
		Dilution Factor: 0.98		Analysis Time..: 21:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320137	MDL.....: 0.011	

Prep Batch #...: 0323012

Mercury	**0.028 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/19/10**	**L9RJP1AX**
		Dilution Factor: 1		Analysis Time..: 08:57	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323004	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

TOTAL Metals

Lot-Sample #...: C0K090449-034 **Matrix.....:** BIOLOGIC
Date Sampled...: 11/04/10 **Date Received..:** 11/09/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0320200						
Aluminum	**4860** ~~B~~	**2.9**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AD**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.23	
Antimony	**0.069** ~~B~~ J	**0.20**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AE**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0032	
Arsenic	**4.6**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AF**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.016	
Beryllium	**0.29**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AG**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0036	
Cadmium	**0.17**	**0.098**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AH**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0089	
Chromium	**17.9** ~~B~~	**0.20**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AJ**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0078	
Cobalt	**3.1**	**0.049**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AK**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0024	
Copper	**8.9** ~~B~~	**0.20**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AL**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0083	
Iron	**14200** ~~B~~ L	**4.9**	**mg/kg**	**SW846 6020**	**11/16-11/21/10**	**L9RJQ1AM**
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.28	

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lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

TOTAL Metals

Lot-Sample #...: C0K090449-034 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	7.9	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AN
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0033	
Manganese	97.7	0.049	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AP
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.014	
Nickel	17.2	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AQ
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0067	
Selenium	0.11 ~~B~~ J	0.49	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AR
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.040	
Silver	0.062 ~~B~~ L	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AT
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0024	
Thallium	0.079 ~~B~~ J	0.098	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AU
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.0020	
Tin	0.70	0.49	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AV
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.10	
Zinc	33.7	0.49	mg/kg	SW846 6020	11/16-11/21/10	L9RJQ1AW
		Dilution Factor: 0.98		Analysis Time..: 23:39	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0320138	MDL.....: 0.011	

Prep Batch #...: 0323013

Mercury	0.025 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/19/10	L9RJQ1AX
		Dilution Factor: 1		Analysis Time..: 09:40	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0323005	MDL.....: 0.011	

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

lew
12/17/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0K090449

Client: Maryland Environmental Service, Millersville, MD Date: December 17, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	AT0-649A-W	C0K090449-001	Tissue
1MS	AT0-649A-WMS	C0K090449-001MS	Tissue
1MSD	AT0-649A-WMSD	C0K090449-001MSD	Tissue
2	AT0-649B-W	C0K090449-002	Tissue
3	AT0-649C-W	C0K090449-003	Tissue
4	AT0-649D-W	C0K090449-004	Tissue
5	AT0-649E-W	C0K090449-005	Tissue
6	AT0-650A-W	C0K090449-006	Tissue
7	AT0-650B-W	C0K090449-007	Tissue
8	AT0-650C-W	C0K090449-008	Tissue
9	AT0-650D-W	C0K090449-009	Tissue
10	AT0-650E-W	C0K090449-010	Tissue
11	AT0-682A-W	C0K090449-011	Tissue
12	AT0-682B-W	C0K090449-012	Tissue
13	AT0-682C-W	C0K090449-013	Tissue
14	PRETEST A-W	C0K090449-014	Tissue
15	PRETEST B-W	C0K090449-015	Tissue
16	PRETEST C-W	C0K090449-016	Tissue
17	AT0-649A-C	C0K090449-017	Tissue
17MS	AT0-649A-CMS	C0K090449-017MS	Tissue
17MSD	AT0-649A-CMSD	C0K090449-017MSD	Tissue
18	AT0-649B-C	C0K090449-018	Tissue
19	AT0-649C-C	C0K090449-019	Tissue
20	AT0-649D-C	C0K090449-020	Tissue
21	AT0-649E-C	C0K090449-021	Tissue
22	AT0-650A-C	C0K090449-022	Tissue
23	AT0-650B-C	C0K090449-023	Tissue
24	AT0-650C-C	C0K090449-024	Tissue
25	AT0-650D-C	C0K090449-025	Tissue
26	AT0-650E-C	C0K090449-026	Tissue
27	AT0-683A-C	C0K090449-027	Tissue
28	AT0-683B-C	C0K090449-028	Tissue
29	AT0-683C-C	C0K090449-029	Tissue
30	PRETESTA-C	C0K090449-030	Tissue
31	PRETESTB-C	C0K090449-031	Tissue
32	PRETESTC-C	C0K090449-032	Tissue

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
33	SRM	C0K090449-033	Tissue
34	SRM	C0K090449-034	Tissue

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - The continuing calibration exhibited acceptable %D values.

Surrogates - All samples exhibited acceptable surrogate recoveries.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
17	PCB 101	45%/OK/OK	L/UL
	PCB 118	OK/43%/OK	L/UL
	PCB 156	OK/OK/49	None for RPD alone

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - Several compounds were flagged (PG) by the laboratory indicating that the percent difference (% D) between the original and confirmation analyses is greater than 40%. The reviewer flagged these and all results with >25% D as estimated (J).

Two standard reference material (SRM) QC samples were analyzed in this data package.

EA Engineering, Science and Technology

Client Sample ID: AT0-649A-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-001	Work Order #...:	L9QR71AC	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	11:15		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	6.0
PCB 18 (BZ)	**16**	**13**	**ug/kg**	**4.5**
PCB 28 (BZ)	**10 ~~J,PG~~ J**	**13**	**ug/kg**	**5.6**
PCB 44 (BZ)	**13**	**13**	**ug/kg**	**6.2**
PCB 49 (BZ)	ND	13	ug/kg	6.5
PCB 52 (BZ)	**29**	**13**	**ug/kg**	**6.4**
PCB 66 (BZ)	ND	13	ug/kg	5.6
PCB 77 (BZ)	ND	13	ug/kg	5.4
PCB 87 (BZ)	ND	13	ug/kg	5.6
PCB 90 (BZ)	ND	13	ug/kg	6.7
PCB 101 (BZ)	**14**	**13**	**ug/kg**	**4.6**
PCB 105 (BZ)	ND	13	ug/kg	7.1
PCB 118 (BZ)	ND	13	ug/kg	5.7
PCB 126 (BZ)	ND	13	ug/kg	6.5
PCB 128 (BZ)	ND	13	ug/kg	5.7
PCB 138 (BZ)	**14 ~~PG~~ J**	**13**	**ug/kg**	**4.5**
PCB 153 (BZ)	**20 J**	**13**	**ug/kg**	**4.9**
PCB 156 (BZ)	ND	13	ug/kg	5.8
PCB 169 (BZ)	ND	13	ug/kg	6.0
PCB 170 (BZ)	ND	13	ug/kg	5.5
PCB 180 (BZ)	ND	13	ug/kg	5.3
PCB 183 (BZ)	ND	13	ug/kg	5.4
PCB 184 (BZ)	ND	13	ug/kg	6.8
PCB 187 (BZ)	**7.6 J**	**13**	**ug/kg**	**7.0**
PCB 195 (BZ)	ND	13	ug/kg	6.7
PCB 206 (BZ)	ND	13	ug/kg	6.9
PCB 209 (BZ)	ND	13	ug/kg	5.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649B-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-002	Work Order #...:	L9QTT1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	11:40		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	84	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	12	ug/kg	5.6
PCB 18 (BZ)	**20**	**12**	**ug/kg**	**4.2**
PCB 28 (BZ)	**15 ~~PG~~ J**	**12**	**ug/kg**	**5.2**
PCB 44 (BZ)	**15**	**12**	**ug/kg**	**5.7**
PCB 49 (BZ)	ND	12	ug/kg	6.0
PCB 52 (BZ)	**33**	**12**	**ug/kg**	**6.0**
PCB 66 (BZ)	ND	12	ug/kg	5.2
PCB 77 (BZ)	ND	12	ug/kg	5.1
PCB 87 (BZ)	ND	12	ug/kg	5.2
PCB 90 (BZ)	ND	12	ug/kg	6.2
PCB 101 (BZ)	**14**	**12**	**ug/kg**	**4.3**
PCB 105 (BZ)	ND	12	ug/kg	6.6
PCB 118 (BZ)	**5.5 ~~J PG~~ J**	**12**	**ug/kg**	**5.3**
PCB 126 (BZ)	ND	12	ug/kg	6.0
PCB 128 (BZ)	ND	12	ug/kg	5.3
PCB 138 (BZ)	**12 ~~PG~~ J**	**12**	**ug/kg**	**4.2**
PCB 153 (BZ)	**20**	**12**	**ug/kg**	**4.5**
PCB 156 (BZ)	ND	12	ug/kg	5.4
PCB 169 (BZ)	ND	12	ug/kg	5.6
PCB 170 (BZ)	ND	12	ug/kg	5.1
PCB 180 (BZ)	**6.8 ~~J~~ J**	**12**	**ug/kg**	**4.9**
PCB 183 (BZ)	ND	12	ug/kg	5.0
PCB 184 (BZ)	ND	12	ug/kg	6.4
PCB 187 (BZ)	**7.5 J**	**12**	**ug/kg**	**6.5**
PCB 195 (BZ)	ND	12	ug/kg	6.3
PCB 206 (BZ)	ND	12	ug/kg	6.4
PCB 209 (BZ)	ND	12	ug/kg	5.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649C-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-003	Work Order #...:	L9QTV1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	12:05		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	14	ug/kg	6.2
PCB 18 (BZ)	**17**	**14**	**ug/kg**	**4.6**
PCB 28 (BZ)	**13 ~~J,PG~~ J**	**14**	**ug/kg**	**5.7**
PCB 44 (BZ)	**14**	**14**	**ug/kg**	**6.3**
PCB 49 (BZ)	ND	14	ug/kg	6.7
PCB 52 (BZ)	**31**	**14**	**ug/kg**	**6.6**
PCB 66 (BZ)	ND	14	ug/kg	5.8
PCB 77 (BZ)	ND	14	ug/kg	5.6
PCB 87 (BZ)	ND	14	ug/kg	5.8
PCB 90 (BZ)	ND	14	ug/kg	6.9
PCB 101 (BZ)	**16**	**14**	**ug/kg**	**4.7**
PCB 105 (BZ)	ND	14	ug/kg	7.3
PCB 118 (BZ)	**6.6 ~~J,PG~~ J**	**14**	**ug/kg**	**5.8**
PCB 126 (BZ)	ND	14	ug/kg	6.7
PCB 128 (BZ)	ND	14	ug/kg	5.8
PCB 138 (BZ)	**15 ~~PG~~ J**	**14**	**ug/kg**	**4.6**
PCB 153 (BZ)	**22**	**14**	**ug/kg**	**5.0**
PCB 156 (BZ)	ND	14	ug/kg	5.9
PCB 169 (BZ)	ND	14	ug/kg	6.2
PCB 170 (BZ)	ND	14	ug/kg	5.6
PCB 180 (BZ)	**7.4 ~~J~~ J**	**14**	**ug/kg**	**5.4**
PCB 183 (BZ)	ND	14	ug/kg	5.5
PCB 184 (BZ)	ND	14	ug/kg	7.0
PCB 187 (BZ)	**8.0 J**	**14**	**ug/kg**	**7.1**
PCB 195 (BZ)	ND	14	ug/kg	6.9
PCB 206 (BZ)	ND	14	ug/kg	7.0
PCB 209 (BZ)	ND	14	ug/kg	6.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	49	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649D-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-004	Work Order #...:	L9QTW1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	12:30		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	6.0
PCB 18 (BZ)	**16**	**13**	**ug/kg**	**4.5**
PCB 28 (BZ)	**11 ~~J,PG~~ J**	**13**	**ug/kg**	**5.6**
PCB 44 (BZ)	**12 J**	**13**	**ug/kg**	**6.1**
PCB 49 (BZ)	ND	13	ug/kg	6.5
PCB 52 (BZ)	**29**	**13**	**ug/kg**	**6.4**
PCB 66 (BZ)	ND	13	ug/kg	5.6
PCB 77 (BZ)	ND	13	ug/kg	5.4
PCB 87 (BZ)	ND	13	ug/kg	5.6
PCB 90 (BZ)	ND	13	ug/kg	6.6
PCB 101 (BZ)	**14**	**13**	**ug/kg**	**4.6**
PCB 105 (BZ)	ND	13	ug/kg	7.1
PCB 118 (BZ)	**5.7 ~~J,PG~~ J**	**13**	**ug/kg**	**5.6**
PCB 126 (BZ)	ND	13	ug/kg	6.5
PCB 128 (BZ)	ND	13	ug/kg	5.6
PCB 138 (BZ)	**13 ~~PG~~ J**	**13**	**ug/kg**	**4.5**
PCB 153 (BZ)	**21**	**13**	**ug/kg**	**4.8**
PCB 156 (BZ)	ND	13	ug/kg	5.7
PCB 169 (BZ)	ND	13	ug/kg	6.0
PCB 170 (BZ)	ND	13	ug/kg	5.5
PCB 180 (BZ)	**7.2 ~~J~~ J**	**13**	**ug/kg**	**5.2**
PCB 183 (BZ)	ND	13	ug/kg	5.4
PCB 184 (BZ)	ND	13	ug/kg	6.8
PCB 187 (BZ)	**7.8 J**	**13**	**ug/kg**	**6.9**
PCB 195 (BZ)	ND	13	ug/kg	6.7
PCB 206 (BZ)	ND	13	ug/kg	6.8
PCB 209 (BZ)	ND	13	ug/kg	5.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	47	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649E-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-005	Work Order #...:	L9QT01AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	12:55		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	83	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	12	ug/kg	5.4
PCB 18 (BZ)	**14**	**12**	**ug/kg**	**4.0**
PCB 28 (BZ)	**9.8 ~~J, PG~~ J**	**12**	**ug/kg**	**5.0**
PCB 44 (BZ)	**11 ~~J~~ J**	**12**	**ug/kg**	**5.5**
PCB 49 (BZ)	ND	12	ug/kg	5.8
PCB 52 (BZ)	**26**	**12**	**ug/kg**	**5.8**
PCB 66 (BZ)	ND	12	ug/kg	5.0
PCB 77 (BZ)	ND	12	ug/kg	4.9
PCB 87 (BZ)	ND	12	ug/kg	5.0
PCB 90 (BZ)	ND	12	ug/kg	6.0
PCB 101 (BZ)	**13**	**12**	**ug/kg**	**4.1**
PCB 105 (BZ)	ND	12	ug/kg	6.4
PCB 118 (BZ)	ND	12	ug/kg	5.1
PCB 126 (BZ)	ND	12	ug/kg	5.8
PCB 128 (BZ)	ND	12	ug/kg	5.1
PCB 138 (BZ)	**11 ~~J, PG~~ J**	**12**	**ug/kg**	**4.0**
PCB 153 (BZ)	**19**	**12**	**ug/kg**	**4.4**
PCB 156 (BZ)	ND	12	ug/kg	5.2
PCB 169 (BZ)	ND	12	ug/kg	5.4
PCB 170 (BZ)	ND	12	ug/kg	4.9
PCB 180 (BZ)	**6.8 ~~J~~ J**	**12**	**ug/kg**	**4.7**
PCB 183 (BZ)	ND	12	ug/kg	4.8
PCB 184 (BZ)	ND	12	ug/kg	6.1
PCB 187 (BZ)	ND	12	ug/kg	6.2
PCB 195 (BZ)	ND	12	ug/kg	6.0
PCB 206 (BZ)	ND	12	ug/kg	6.2
PCB 209 (BZ)	ND	12	ug/kg	5.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	47	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW 12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650A-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-006	Work Order #...:	L9QT11AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	13:20		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	83	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	12	ug/kg	5.4
PCB 18 (BZ)	ND	12	ug/kg	4.0
PCB 28 (BZ)	ND	12	ug/kg	5.0
PCB 44 (BZ)	ND	12	ug/kg	5.5
PCB 49 (BZ)	ND	12	ug/kg	5.8
PCB 52 (BZ)	ND	12	ug/kg	5.8
PCB 66 (BZ)	ND	12	ug/kg	5.0
PCB 77 (BZ)	ND	12	ug/kg	4.9
PCB 87 (BZ)	ND	12	ug/kg	5.0
PCB 90 (BZ)	ND	12	ug/kg	6.0
PCB 101 (BZ)	ND	12	ug/kg	4.1
PCB 105 (BZ)	ND	12	ug/kg	6.4
PCB 118 (BZ)	ND	12	ug/kg	5.1
PCB 126 (BZ)	ND	12	ug/kg	5.8
PCB 128 (BZ)	ND	12	ug/kg	5.1
PCB 138 (BZ)	**4.8 ~~J, PG~~ J**	**12**	**ug/kg**	**4.0**
PCB 153 (BZ)	**9.2 ~~J~~ J**	**12**	**ug/kg**	**4.4**
PCB 156 (BZ)	ND	12	ug/kg	5.2
PCB 169 (BZ)	ND	12	ug/kg	5.4
PCB 170 (BZ)	ND	12	ug/kg	4.9
PCB 180 (BZ)	ND	12	ug/kg	4.7
PCB 183 (BZ)	ND	12	ug/kg	4.8
PCB 184 (BZ)	ND	12	ug/kg	6.1
PCB 187 (BZ)	ND	12	ug/kg	6.2
PCB 195 (BZ)	ND	12	ug/kg	6.0
PCB 206 (BZ)	ND	12	ug/kg	6.2
PCB 209 (BZ)	ND	12	ug/kg	5.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650B-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-007	Work Order #...:	L9QT31AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	13:45		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	6.0
PCB 18 (BZ)	ND	13	ug/kg	4.5
PCB 28 (BZ)	ND	13	ug/kg	5.6
PCB 44 (BZ)	ND	13	ug/kg	6.2
PCB 49 (BZ)	ND	13	ug/kg	6.5
PCB 52 (BZ)	ND	13	ug/kg	6.4
PCB 66 (BZ)	ND	13	ug/kg	5.6
PCB 77 (BZ)	ND	13	ug/kg	5.4
PCB 87 (BZ)	ND	13	ug/kg	5.6
PCB 90 (BZ)	ND	13	ug/kg	6.7
PCB 101 (BZ)	ND	13	ug/kg	4.6
PCB 105 (BZ)	ND	13	ug/kg	7.1
PCB 118 (BZ)	ND	13	ug/kg	5.6
PCB 126 (BZ)	ND	13	ug/kg	6.5
PCB 128 (BZ)	ND	13	ug/kg	5.7
PCB 138 (BZ)	**5.1 ~~J,PG~~ J**	**13**	**ug/kg**	**4.5**
PCB 153 (BZ)	**8.0 J**	**13**	**ug/kg**	**4.9**
PCB 156 (BZ)	ND	13	ug/kg	5.8
PCB 169 (BZ)	ND	13	ug/kg	6.0
PCB 170 (BZ)	ND	13	ug/kg	5.5
PCB 180 (BZ)	ND	13	ug/kg	5.2
PCB 183 (BZ)	ND	13	ug/kg	5.4
PCB 184 (BZ)	ND	13	ug/kg	6.8
PCB 187 (BZ)	ND	13	ug/kg	6.9
PCB 195 (BZ)	ND	13	ug/kg	6.7
PCB 206 (BZ)	ND	13	ug/kg	6.8
PCB 209 (BZ)	ND	13	ug/kg	5.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

8

EA Engineering, Science and Technology

Client Sample ID: AT0-650C-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-008	Work Order #...:	L9QT51AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	14:10		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	6.1
PCB 18 (BZ)	ND	13	ug/kg	4.5
PCB 28 (BZ)	ND	13	ug/kg	5.6
PCB 44 (BZ)	ND	13	ug/kg	6.2
PCB 49 (BZ)	ND	13	ug/kg	6.5
PCB 52 (BZ)	ND	13	ug/kg	6.5
PCB 66 (BZ)	ND	13	ug/kg	5.7
PCB 77 (BZ)	ND	13	ug/kg	5.5
PCB 87 (BZ)	ND	13	ug/kg	5.7
PCB 90 (BZ)	ND	13	ug/kg	6.7
PCB 101 (BZ)	ND	13	ug/kg	4.6
PCB 105 (BZ)	ND	13	ug/kg	7.1
PCB 118 (BZ)	ND	13	ug/kg	5.7
PCB 126 (BZ)	ND	13	ug/kg	6.6
PCB 128 (BZ)	ND	13	ug/kg	5.7
PCB 138 (BZ)	**6.4 ~~J PG~~ J**	**13**	**ug/kg**	**4.5**
PCB 153 (BZ)	**12 ~~J~~ J**	**13**	**ug/kg**	**4.9**
PCB 156 (BZ)	ND	13	ug/kg	5.8
PCB 169 (BZ)	ND	13	ug/kg	6.1
PCB 170 (BZ)	ND	13	ug/kg	5.5
PCB 180 (BZ)	ND	13	ug/kg	5.3
PCB 183 (BZ)	ND	13	ug/kg	5.4
PCB 184 (BZ)	ND	13	ug/kg	6.9
PCB 187 (BZ)	ND	13	ug/kg	7.0
PCB 195 (BZ)	ND	13	ug/kg	6.8
PCB 206 (BZ)	ND	13	ug/kg	6.9
PCB 209 (BZ)	ND	13	ug/kg	6.0

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650D-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-009	Work Order #...:	L9QT61AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	14:35		
Dilution Factor:	1	Initial Wgt/Vol:	1.6 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	5.9
PCB 18 (BZ)	ND	13	ug/kg	4.4
PCB 28 (BZ)	ND	13	ug/kg	5.5
PCB 44 (BZ)	ND	13	ug/kg	6.0
PCB 49 (BZ)	ND	13	ug/kg	6.3
PCB 52 (BZ)	ND	13	ug/kg	6.2
PCB 66 (BZ)	ND	13	ug/kg	5.5
PCB 77 (BZ)	ND	13	ug/kg	5.3
PCB 87 (BZ)	ND	13	ug/kg	5.5
PCB 90 (BZ)	ND	13	ug/kg	6.5
PCB 101 (BZ)	ND	13	ug/kg	4.5
PCB 105 (BZ)	ND	13	ug/kg	6.9
PCB 118 (BZ)	ND	13	ug/kg	5.5
PCB 126 (BZ)	ND	13	ug/kg	6.3
PCB 128 (BZ)	ND	13	ug/kg	5.5
PCB 138 (BZ)	**4.8 ~~J, PG~~ J**	**13**	**ug/kg**	**4.4**
PCB 153 (BZ)	**9.5 ~~J~~ J**	**13**	**ug/kg**	**4.7**
PCB 156 (BZ)	ND	13	ug/kg	5.6
PCB 169 (BZ)	ND	13	ug/kg	5.9
PCB 170 (BZ)	ND	13	ug/kg	5.4
PCB 180 (BZ)	ND	13	ug/kg	5.1
PCB 183 (BZ)	ND	13	ug/kg	5.3
PCB 184 (BZ)	ND	13	ug/kg	6.7
PCB 187 (BZ)	ND	13	ug/kg	6.8
PCB 195 (BZ)	ND	13	ug/kg	6.6
PCB 206 (BZ)	ND	13	ug/kg	6.7
PCB 209 (BZ)	ND	13	ug/kg	5.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650E-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-010	Work Order #...:	L9QVC1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	15:00		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	6.0
PCB 18 (BZ)	ND	13	ug/kg	4.4
PCB 28 (BZ)	ND	13	ug/kg	5.5
PCB 44 (BZ)	ND	13	ug/kg	6.1
PCB 49 (BZ)	ND	13	ug/kg	6.4
PCB 52 (BZ)	ND	13	ug/kg	6.4
PCB 66 (BZ)	ND	13	ug/kg	5.6
PCB 77 (BZ)	ND	13	ug/kg	5.4
PCB 87 (BZ)	ND	13	ug/kg	5.6
PCB 90 (BZ)	ND	13	ug/kg	6.6
PCB 101 (BZ)	ND	13	ug/kg	4.6
PCB 105 (BZ)	ND	13	ug/kg	7.0
PCB 118 (BZ)	ND	13	ug/kg	5.6
PCB 126 (BZ)	ND	13	ug/kg	6.5
PCB 128 (BZ)	ND	13	ug/kg	5.6
PCB 138 (BZ)	**6.3 ~~J,PG~~ J**	**13**	**ug/kg**	**4.5**
PCB 153 (BZ)	**12 ~~J~~ J**	**13**	**ug/kg**	**4.8**
PCB 156 (BZ)	ND	13	ug/kg	5.7
PCB 169 (BZ)	ND	13	ug/kg	6.0
PCB 170 (BZ)	ND	13	ug/kg	5.5
PCB 180 (BZ)	ND	13	ug/kg	5.2
PCB 183 (BZ)	ND	13	ug/kg	5.4
PCB 184 (BZ)	ND	13	ug/kg	6.8
PCB 187 (BZ)	ND	13	ug/kg	6.9
PCB 195 (BZ)	ND	13	ug/kg	6.7
PCB 206 (BZ)	ND	13	ug/kg	6.8
PCB 209 (BZ)	ND	13	ug/kg	5.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-682A-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-011	Work Order #...:	L9QVE1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	15:25		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	86	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	14	ug/kg	6.4
PCB 18 (BZ)	ND	14	ug/kg	4.8
PCB 28 (BZ)	ND	14	ug/kg	5.9
PCB 44 (BZ)	ND	14	ug/kg	6.5
PCB 49 (BZ)	ND	14	ug/kg	6.9
PCB 52 (BZ)	ND	14	ug/kg	6.8
PCB 66 (BZ)	ND	14	ug/kg	6.0
PCB 77 (BZ)	ND	14	ug/kg	5.8
PCB 87 (BZ)	ND	14	ug/kg	6.0
PCB 90 (BZ)	ND	14	ug/kg	7.1
PCB 101 (BZ)	ND	14	ug/kg	4.9
PCB 105 (BZ)	ND	14	ug/kg	7.5
PCB 118 (BZ)	ND	14	ug/kg	6.0
PCB 126 (BZ)	ND	14	ug/kg	6.9
PCB 128 (BZ)	ND	14	ug/kg	6.0
PCB 138 (BZ)	**5.2 ~~J, PG~~ J**	**14**	**ug/kg**	**4.8**
PCB 153 (BZ)	**8.5 J**	**14**	**ug/kg**	**5.2**
PCB 156 (BZ)	ND	14	ug/kg	6.1
PCB 169 (BZ)	ND	14	ug/kg	6.4
PCB 170 (BZ)	ND	14	ug/kg	5.8
PCB 180 (BZ)	ND	14	ug/kg	5.6
PCB 183 (BZ)	ND	14	ug/kg	5.7
PCB 184 (BZ)	ND	14	ug/kg	7.3
PCB 187 (BZ)	ND	14	ug/kg	7.4
PCB 195 (BZ)	ND	14	ug/kg	7.1
PCB 206 (BZ)	ND	14	ug/kg	7.3
PCB 209 (BZ)	ND	14	ug/kg	6.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

RW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-682B-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-012	Work Order #...:	L9QVJ1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	15:50		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	14	ug/kg	6.2
PCB 18 (BZ)	ND	14	ug/kg	4.6
PCB 28 (BZ)	ND	14	ug/kg	5.8
PCB 44 (BZ)	ND	14	ug/kg	6.4
PCB 49 (BZ)	ND	14	ug/kg	6.7
PCB 52 (BZ)	ND	14	ug/kg	6.6
PCB 66 (BZ)	ND	14	ug/kg	5.8
PCB 77 (BZ)	ND	14	ug/kg	5.6
PCB 87 (BZ)	ND	14	ug/kg	5.8
PCB 90 (BZ)	ND	14	ug/kg	6.9
PCB 101 (BZ)	ND	14	ug/kg	4.7
PCB 105 (BZ)	ND	14	ug/kg	7.3
PCB 118 (BZ)	ND	14	ug/kg	5.8
PCB 126 (BZ)	ND	14	ug/kg	6.7
PCB 128 (BZ)	ND	14	ug/kg	5.8
PCB 138 (BZ)	**7.1 ~~J,PG~~ J**	**14**	**ug/kg**	**4.6**
PCB 153 (BZ)	**13 ~~J~~ J**	**14**	**ug/kg**	**5.0**
PCB 156 (BZ)	ND	14	ug/kg	5.9
PCB 169 (BZ)	ND	14	ug/kg	6.2
PCB 170 (BZ)	ND	14	ug/kg	5.7
PCB 180 (BZ)	ND	14	ug/kg	5.4
PCB 183 (BZ)	ND	14	ug/kg	5.6
PCB 184 (BZ)	ND	14	ug/kg	7.0
PCB 187 (BZ)	ND	14	ug/kg	7.2
PCB 195 (BZ)	ND	14	ug/kg	6.9
PCB 206 (BZ)	ND	14	ug/kg	7.1
PCB 209 (BZ)	ND	14	ug/kg	6.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-682C-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-013	Work Order #...:	L9QVM1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	16:15		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	84	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	5.8
PCB 18 (BZ)	ND	13	ug/kg	4.3
PCB 28 (BZ)	ND	13	ug/kg	5.4
PCB 44 (BZ)	ND	13	ug/kg	5.9
PCB 49 (BZ)	ND	13	ug/kg	6.2
PCB 52 (BZ)	ND	13	ug/kg	6.1
PCB 66 (BZ)	ND	13	ug/kg	5.4
PCB 77 (BZ)	ND	13	ug/kg	5.2
PCB 87 (BZ)	ND	13	ug/kg	5.4
PCB 90 (BZ)	ND	13	ug/kg	6.4
PCB 101 (BZ)	ND	13	ug/kg	4.4
PCB 105 (BZ)	ND	13	ug/kg	6.8
PCB 118 (BZ)	ND	13	ug/kg	5.4
PCB 126 (BZ)	ND	13	ug/kg	6.2
PCB 128 (BZ)	ND	13	ug/kg	5.4
PCB 138 (BZ)	**5.6 ~~J,PG~~ J**	**13**	**ug/kg**	**4.3**
PCB 153 (BZ)	**9.6 J**	**13**	**ug/kg**	**4.7**
PCB 156 (BZ)	ND	13	ug/kg	5.5
PCB 169 (BZ)	ND	13	ug/kg	5.8
PCB 170 (BZ)	ND	13	ug/kg	5.3
PCB 180 (BZ)	ND	13	ug/kg	5.0
PCB 183 (BZ)	ND	13	ug/kg	5.2
PCB 184 (BZ)	ND	13	ug/kg	6.6
PCB 187 (BZ)	ND	13	ug/kg	6.7
PCB 195 (BZ)	ND	13	ug/kg	6.4
PCB 206 (BZ)	ND	13	ug/kg	6.6
PCB 209 (BZ)	ND	13	ug/kg	5.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

LW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST A-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-014	Work Order #...:	L9QVP1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	16:40		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	5.9
PCB 18 (BZ)	ND	13	ug/kg	4.4
PCB 28 (BZ)	ND	13	ug/kg	5.5
PCB 44 (BZ)	ND	13	ug/kg	6.0
PCB 49 (BZ)	ND	13	ug/kg	6.3
PCB 52 (BZ)	ND	13	ug/kg	6.3
PCB 66 (BZ)	ND	13	ug/kg	5.5
PCB 77 (BZ)	ND	13	ug/kg	5.3
PCB 87 (BZ)	ND	13	ug/kg	5.5
PCB 90 (BZ)	ND	13	ug/kg	6.5
PCB 101 (BZ)	ND	13	ug/kg	4.5
PCB 105 (BZ)	ND	13	ug/kg	6.9
PCB 118 (BZ)	ND	13	ug/kg	5.5
PCB 126 (BZ)	ND	13	ug/kg	6.4
PCB 128 (BZ)	ND	13	ug/kg	5.5
PCB 138 (BZ)	**6.7 ~~J,PG~~ J**	**13**	**ug/kg**	**4.4**
PCB 153 (BZ)	**9.2 J**	**13**	**ug/kg**	**4.8**
PCB 156 (BZ)	ND	13	ug/kg	5.6
PCB 169 (BZ)	ND	13	ug/kg	5.9
PCB 170 (BZ)	ND	13	ug/kg	5.4
PCB 180 (BZ)	ND	13	ug/kg	5.1
PCB 183 (BZ)	ND	13	ug/kg	5.3
PCB 184 (BZ)	ND	13	ug/kg	6.7
PCB 187 (BZ)	ND	13	ug/kg	6.8
PCB 195 (BZ)	ND	13	ug/kg	6.6
PCB 206 (BZ)	ND	13	ug/kg	6.7
PCB 209 (BZ)	ND	13	ug/kg	5.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST B-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-015	Work Order #...:	L9QVT1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	17:05		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	84	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	5.8
PCB 18 (BZ)	ND	13	ug/kg	4.3
PCB 28 (BZ)	ND	13	ug/kg	5.3
PCB 44 (BZ)	ND	13	ug/kg	5.9
PCB 49 (BZ)	ND	13	ug/kg	6.2
PCB 52 (BZ)	ND	13	ug/kg	6.1
PCB 66 (BZ)	ND	13	ug/kg	5.4
PCB 77 (BZ)	ND	13	ug/kg	5.2
PCB 87 (BZ)	ND	13	ug/kg	5.3
PCB 90 (BZ)	ND	13	ug/kg	6.4
PCB 101 (BZ)	ND	13	ug/kg	4.4
PCB 105 (BZ)	ND	13	ug/kg	6.8
PCB 118 (BZ)	ND	13	ug/kg	5.4
PCB 126 (BZ)	ND	13	ug/kg	6.2
PCB 128 (BZ)	ND	13	ug/kg	5.4
PCB 138 (BZ)	ND	13	ug/kg	4.3
PCB 153 (BZ)	ND	13	ug/kg	4.6
PCB 156 (BZ)	ND	13	ug/kg	5.5
PCB 169 (BZ)	ND	13	ug/kg	5.8
PCB 170 (BZ)	ND	13	ug/kg	5.2
PCB 180 (BZ)	ND	13	ug/kg	5.0
PCB 183 (BZ)	ND	13	ug/kg	5.1
PCB 184 (BZ)	ND	13	ug/kg	6.5
PCB 187 (BZ)	ND	13	ug/kg	6.6
PCB 195 (BZ)	ND	13	ug/kg	6.4
PCB 206 (BZ)	ND	13	ug/kg	6.5
PCB 209 (BZ)	ND	13	ug/kg	5.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	39	(35 - 140)
PCB 205 (BZ)	37	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MJ
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST C-W

GC Semivolatiles

Lot-Sample #...:	C0K090449-016	Work Order #...:	L9QVW1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327035	Analysis Time..:	17:30		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	85	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	13	ug/kg	5.9
PCB 18 (BZ)	ND	13	ug/kg	4.4
PCB 28 (BZ)	ND	13	ug/kg	5.5
PCB 44 (BZ)	ND	13	ug/kg	6.1
PCB 49 (BZ)	ND	13	ug/kg	6.4
PCB 52 (BZ)	ND	13	ug/kg	6.3
PCB 66 (BZ)	ND	13	ug/kg	5.5
PCB 77 (BZ)	ND	13	ug/kg	5.4
PCB 87 (BZ)	ND	13	ug/kg	5.5
PCB 90 (BZ)	ND	13	ug/kg	6.6
PCB 101 (BZ)	ND	13	ug/kg	4.5
PCB 105 (BZ)	ND	13	ug/kg	7.0
PCB 118 (BZ)	ND	13	ug/kg	5.6
PCB 126 (BZ)	ND	13	ug/kg	6.4
PCB 128 (BZ)	ND	13	ug/kg	5.6
PCB 138 (BZ)	**4.9 ~~J, PG~~ J**	**13**	**ug/kg**	**4.4**
PCB 153 (BZ)	**7.3 ~~J~~ J**	**13**	**ug/kg**	**4.8**
PCB 156 (BZ)	ND	13	ug/kg	5.7
PCB 169 (BZ)	ND	13	ug/kg	5.9
PCB 170 (BZ)	ND	13	ug/kg	5.4
PCB 180 (BZ)	ND	13	ug/kg	5.2
PCB 183 (BZ)	ND	13	ug/kg	5.3
PCB 184 (BZ)	ND	13	ug/kg	6.7
PCB 187 (BZ)	ND	13	ug/kg	6.8
PCB 195 (BZ)	ND	13	ug/kg	6.6
PCB 206 (BZ)	ND	13	ug/kg	6.8
PCB 209 (BZ)	ND	13	ug/kg	5.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649A-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-017	Work Order #...:	L9QV21AC	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	19:35		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	90	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	20	ug/kg	9.3
PCB 18 (BZ)	**15 J**	**20**	**ug/kg**	**6.9**
PCB 28 (BZ)	**19 ~~J, PG~~ J**	**20**	**ug/kg**	**8.6**
PCB 44 (BZ)	ND	20	ug/kg	9.5
PCB 49 (BZ)	ND	20	ug/kg	10
PCB 52 (BZ)	**20**	**20**	**ug/kg**	**9.8**
PCB 66 (BZ)	ND	20	ug/kg	8.6
PCB 77 (BZ)	ND	20	ug/kg	8.4
PCB 87 (BZ)	ND	20	ug/kg	8.6
PCB 90 (BZ)	ND	20	ug/kg	10
PCB 101 (BZ)	**10 ~~J~~ L**	**20**	**ug/kg**	**7.0**
PCB 105 (BZ)	ND	20	ug/kg	11
PCB 118 (BZ)	~~ND~~ UL	20	ug/kg	8.7
PCB 126 (BZ)	ND	20	ug/kg	10
PCB 128 (BZ)	**10 J**	**20**	**ug/kg**	**8.7**
PCB 138 (BZ)	**22 ~~PG~~ J**	**20**	**ug/kg**	**6.9**
PCB 153 (BZ)	**16 J**	**20**	**ug/kg**	**7.5**
PCB 156 (BZ)	ND	20	ug/kg	8.8
PCB 169 (BZ)	ND	20	ug/kg	9.3
PCB 170 (BZ)	ND	20	ug/kg	8.4
PCB 180 (BZ)	ND	20	ug/kg	8.1
PCB 183 (BZ)	ND	20	ug/kg	8.3
PCB 184 (BZ)	ND	20	ug/kg	10
PCB 187 (BZ)	ND	20	ug/kg	11
PCB 195 (BZ)	ND	20	ug/kg	10
PCB 206 (BZ)	ND	20	ug/kg	11
PCB 209 (BZ)	ND	20	ug/kg	9.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649B-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-018	Work Order #...:	L9QV41AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	20:50		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	89	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	18	ug/kg	8.0
PCB 18 (BZ)	ND	18	ug/kg	5.9
PCB 28 (BZ)	**8.6 ~~J,PG~~ J**	**18**	**ug/kg**	**7.4**
PCB 44 (BZ)	ND	18	ug/kg	8.2
PCB 49 (BZ)	ND	18	ug/kg	8.6
PCB 52 (BZ)	**10 J**	**18**	**ug/kg**	**8.5**
PCB 66 (BZ)	ND	18	ug/kg	7.4
PCB 77 (BZ)	ND	18	ug/kg	7.2
PCB 87 (BZ)	ND	18	ug/kg	7.4
PCB 90 (BZ)	ND	18	ug/kg	8.9
PCB 101 (BZ)	ND	18	ug/kg	6.1
PCB 105 (BZ)	ND	18	ug/kg	9.4
PCB 118 (BZ)	ND	18	ug/kg	7.5
PCB 126 (BZ)	ND	18	ug/kg	8.6
PCB 128 (BZ)	ND	18	ug/kg	7.5
PCB 138 (BZ)	ND	18	ug/kg	6.0
PCB 153 (BZ)	ND	18	ug/kg	6.5
PCB 156 (BZ)	ND	18	ug/kg	7.6
PCB 169 (BZ)	ND	18	ug/kg	8.0
PCB 170 (BZ)	ND	18	ug/kg	7.3
PCB 180 (BZ)	ND	18	ug/kg	7.0
PCB 183 (BZ)	ND	18	ug/kg	7.2
PCB 184 (BZ)	ND	18	ug/kg	9.1
PCB 187 (BZ)	ND	18	ug/kg	9.2
PCB 195 (BZ)	ND	18	ug/kg	8.9
PCB 206 (BZ)	ND	18	ug/kg	9.1
PCB 209 (BZ)	ND	18	ug/kg	7.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649C-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-019	Work Order #...:	L9QV61AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	21:15		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	90	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	21	ug/kg	9.3
PCB 18 (BZ)	**13 J**	**21**	**ug/kg**	**6.9**
PCB 28 (BZ)	**17 ~~J,PG~~ J**	**21**	**ug/kg**	**8.6**
PCB 44 (BZ)	ND	21	ug/kg	9.5
PCB 49 (BZ)	ND	21	ug/kg	10
PCB 52 (BZ)	**16 J**	**21**	**ug/kg**	**9.9**
PCB 66 (BZ)	ND	21	ug/kg	8.7
PCB 77 (BZ)	ND	21	ug/kg	8.4
PCB 87 (BZ)	ND	21	ug/kg	8.7
PCB 90 (BZ)	ND	21	ug/kg	10
PCB 101 (BZ)	ND	21	ug/kg	7.1
PCB 105 (BZ)	ND	21	ug/kg	11
PCB 118 (BZ)	ND	21	ug/kg	8.7
PCB 126 (BZ)	ND	21	ug/kg	10
PCB 128 (BZ)	ND	21	ug/kg	8.7
PCB 138 (BZ)	ND	21	ug/kg	6.9
PCB 153 (BZ)	ND	21	ug/kg	7.5
PCB 156 (BZ)	ND	21	ug/kg	8.9
PCB 169 (BZ)	ND	21	ug/kg	9.3
PCB 170 (BZ)	ND	21	ug/kg	8.5
PCB 180 (BZ)	ND	21	ug/kg	8.1
PCB 183 (BZ)	ND	21	ug/kg	8.3
PCB 184 (BZ)	ND	21	ug/kg	11
PCB 187 (BZ)	ND	21	ug/kg	11
PCB 195 (BZ)	ND	21	ug/kg	10
PCB 206 (BZ)	ND	21	ug/kg	11
PCB 209 (BZ)	ND	21	ug/kg	9.2

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

nw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649D-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-020	Work Order #...:	L9QV71AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	21:40		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	91	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	22	ug/kg	10
PCB 18 (BZ)	**11 J**	**22**	**ug/kg**	**7.4**
PCB 28 (BZ)	**15 ~~J,PG~~ J**	**22**	**ug/kg**	**9.3**
PCB 44 (BZ)	ND	22	ug/kg	10
PCB 49 (BZ)	ND	22	ug/kg	11
PCB 52 (BZ)	**15 J**	**22**	**ug/kg**	**11**
PCB 66 (BZ)	ND	22	ug/kg	9.3
PCB 77 (BZ)	ND	22	ug/kg	9.0
PCB 87 (BZ)	ND	22	ug/kg	9.3
PCB 90 (BZ)	ND	22	ug/kg	11
PCB 101 (BZ)	ND	22	ug/kg	7.6
PCB 105 (BZ)	ND	22	ug/kg	12
PCB 118 (BZ)	ND	22	ug/kg	9.4
PCB 126 (BZ)	ND	22	ug/kg	11
PCB 128 (BZ)	ND	22	ug/kg	9.4
PCB 138 (BZ)	ND	22	ug/kg	7.5
PCB 153 (BZ)	ND	22	ug/kg	8.1
PCB 156 (BZ)	ND	22	ug/kg	9.6
PCB 169 (BZ)	ND	22	ug/kg	10
PCB 170 (BZ)	ND	22	ug/kg	9.1
PCB 180 (BZ)	ND	22	ug/kg	8.7
PCB 183 (BZ)	ND	22	ug/kg	9.0
PCB 184 (BZ)	ND	22	ug/kg	11
PCB 187 (BZ)	ND	22	ug/kg	12
PCB 195 (BZ)	ND	22	ug/kg	11
PCB 206 (BZ)	ND	22	ug/kg	11
PCB 209 (BZ)	ND	22	ug/kg	9.9

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	43	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649E-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-021	Work Order #...:	L9QV81AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	22:05		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	88	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	17	ug/kg	7.6
PCB 18 (BZ)	ND	17	ug/kg	5.6
PCB 28 (BZ)	**8.3 ~~J, PG~~ J**	**17**	**ug/kg**	**7.0**
PCB 44 (BZ)	ND	17	ug/kg	7.8
PCB 49 (BZ)	ND	17	ug/kg	8.2
PCB 52 (BZ)	**8.2 ~~J, PG~~ J**	**17**	**ug/kg**	**8.1**
PCB 66 (BZ)	ND	17	ug/kg	7.1
PCB 77 (BZ)	ND	17	ug/kg	6.9
PCB 87 (BZ)	**70**	**17**	**ug/kg**	**7.1**
PCB 90 (BZ)	ND	17	ug/kg	8.4
PCB 101 (BZ)	**35 J**	**17**	**ug/kg**	**5.8**
PCB 105 (BZ)	**130 ~~PG~~ J**	**17**	**ug/kg**	**8.9**
PCB 118 (BZ)	**150 ~~PG~~**	**17**	**ug/kg**	**7.1**
PCB 126 (BZ)	**38 ~~PG~~**	**17**	**ug/kg**	**8.2**
PCB 128 (BZ)	**220**	**17**	**ug/kg**	**7.1**
PCB 138 (BZ)	**560 J**	**17**	**ug/kg**	**5.7**
PCB 153 (BZ)	**290**	**17**	**ug/kg**	**6.1**
PCB 156 (BZ)	**150**	**17**	**ug/kg**	**7.3**
PCB 169 (BZ)	ND	17	ug/kg	7.6
PCB 170 (BZ)	**260**	**17**	**ug/kg**	**6.9**
PCB 180 (BZ)	**120 ~~PG~~ J**	**17**	**ug/kg**	**6.6**
PCB 183 (BZ)	ND	17	ug/kg	6.8
PCB 184 (BZ)	ND	17	ug/kg	8.6
PCB 187 (BZ)	**58**	**17**	**ug/kg**	**8.8**
PCB 195 (BZ)	ND	17	ug/kg	8.5
PCB 206 (BZ)	ND	17	ug/kg	8.6
PCB 209 (BZ)	ND	17	ug/kg	7.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	42	(35 - 140)
PCB 205 (BZ)	104	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650A-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-022	Work Order #...:	L9QV91AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	22:30		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	89	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	18	ug/kg	8.3
PCB 18 (BZ)	ND	18	ug/kg	6.2
PCB 28 (BZ)	ND	18	ug/kg	7.7
PCB 44 (BZ)	ND	18	ug/kg	8.5
PCB 49 (BZ)	ND	18	ug/kg	9.0
PCB 52 (BZ)	ND	18	ug/kg	8.8
PCB 66 (BZ)	ND	18	ug/kg	7.8
PCB 77 (BZ)	ND	18	ug/kg	7.5
PCB 87 (BZ)	ND	18	ug/kg	7.7
PCB 90 (BZ)	ND	18	ug/kg	9.2
PCB 101 (BZ)	ND	18	ug/kg	6.3
PCB 105 (BZ)	ND	18	ug/kg	9.8
PCB 118 (BZ)	ND	18	ug/kg	7.8
PCB 126 (BZ)	ND	18	ug/kg	9.0
PCB 128 (BZ)	ND	18	ug/kg	7.8
PCB 138 (BZ)	ND	18	ug/kg	6.2
PCB 153 (BZ)	ND	18	ug/kg	6.7
PCB 156 (BZ)	ND	18	ug/kg	8.0
PCB 169 (BZ)	ND	18	ug/kg	8.3
PCB 170 (BZ)	ND	18	ug/kg	7.6
PCB 180 (BZ)	ND	18	ug/kg	7.3
PCB 183 (BZ)	ND	18	ug/kg	7.5
PCB 184 (BZ)	ND	18	ug/kg	9.4
PCB 187 (BZ)	ND	18	ug/kg	9.6
PCB 195 (BZ)	ND	18	ug/kg	9.3
PCB 206 (BZ)	ND	18	ug/kg	9.5
PCB 209 (BZ)	ND	18	ug/kg	8.2

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	44	(35 - 140)
PCB 205 (BZ)	40	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

kw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650B-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-023	Work Order #...:	L9QWA1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	22:55		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	92	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	25	ug/kg	11
PCB 18 (BZ)	ND	25	ug/kg	8.3
PCB 28 (BZ)	ND	25	ug/kg	10
PCB 44 (BZ)	ND	25	ug/kg	11
PCB 49 (BZ)	ND	25	ug/kg	12
PCB 52 (BZ)	ND	25	ug/kg	12
PCB 66 (BZ)	ND	25	ug/kg	10
PCB 77 (BZ)	ND	25	ug/kg	10
PCB 87 (BZ)	ND	25	ug/kg	10
PCB 90 (BZ)	ND	25	ug/kg	12
PCB 101 (BZ)	ND	25	ug/kg	8.5
PCB 105 (BZ)	ND	25	ug/kg	13
PCB 118 (BZ)	ND	25	ug/kg	10
PCB 126 (BZ)	ND	25	ug/kg	12
PCB 128 (BZ)	ND	25	ug/kg	11
PCB 138 (BZ)	ND	25	ug/kg	8.4
PCB 153 (BZ)	ND	25	ug/kg	9.0
PCB 156 (BZ)	ND	25	ug/kg	11
PCB 169 (BZ)	ND	25	ug/kg	11
PCB 170 (BZ)	ND	25	ug/kg	10
PCB 180 (BZ)	ND	25	ug/kg	9.8
PCB 183 (BZ)	ND	25	ug/kg	10
PCB 184 (BZ)	ND	25	ug/kg	13
PCB 187 (BZ)	ND	25	ug/kg	13
PCB 195 (BZ)	ND	25	ug/kg	12
PCB 206 (BZ)	ND	25	ug/kg	13
PCB 209 (BZ)	ND	25	ug/kg	11

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650C-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-024	Work Order #...:	L9QWC1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	23:20		
Dilution Factor:	1	Initial Wgt/Vol:	1.4 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	90	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	20	ug/kg	8.8
PCB 18 (BZ)	ND	20	ug/kg	6.6
PCB 28 (BZ)	ND	20	ug/kg	8.2
PCB 44 (BZ)	ND	20	ug/kg	9.0
PCB 49 (BZ)	ND	20	ug/kg	9.5
PCB 52 (BZ)	ND	20	ug/kg	9.4
PCB 66 (BZ)	ND	20	ug/kg	8.2
PCB 77 (BZ)	ND	20	ug/kg	8.0
PCB 87 (BZ)	ND	20	ug/kg	8.2
PCB 90 (BZ)	ND	20	ug/kg	9.8
PCB 101 (BZ)	ND	20	ug/kg	6.7
PCB 105 (BZ)	ND	20	ug/kg	10
PCB 118 (BZ)	ND	20	ug/kg	8.3
PCB 126 (BZ)	ND	20	ug/kg	9.5
PCB 128 (BZ)	ND	20	ug/kg	8.3
PCB 138 (BZ)	ND	20	ug/kg	6.6
PCB 153 (BZ)	ND	20	ug/kg	7.1
PCB 156 (BZ)	ND	20	ug/kg	8.4
PCB 169 (BZ)	ND	20	ug/kg	8.8
PCB 170 (BZ)	ND	20	ug/kg	8.0
PCB 180 (BZ)	ND	20	ug/kg	7.7
PCB 183 (BZ)	ND	20	ug/kg	7.9
PCB 184 (BZ)	ND	20	ug/kg	10
PCB 187 (BZ)	ND	20	ug/kg	10
PCB 195 (BZ)	ND	20	ug/kg	9.8
PCB 206 (BZ)	ND	20	ug/kg	10
PCB 209 (BZ)	ND	20	ug/kg	8.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	42	(35 - 140)
PCB 205 (BZ)	39	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650D-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-025	Work Order #...:	L9QWE1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/25/10		
Prep Batch #...:	0327041	Analysis Time..:	23:45		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	90	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	20	ug/kg	9.2
PCB 18 (BZ)	ND	20	ug/kg	6.8
PCB 28 (BZ)	ND	20	ug/kg	8.5
PCB 44 (BZ)	ND	20	ug/kg	9.4
PCB 49 (BZ)	ND	20	ug/kg	9.9
PCB 52 (BZ)	ND	20	ug/kg	9.8
PCB 66 (BZ)	ND	20	ug/kg	8.6
PCB 77 (BZ)	ND	20	ug/kg	8.3
PCB 87 (BZ)	ND	20	ug/kg	8.5
PCB 90 (BZ)	ND	20	ug/kg	10
PCB 101 (BZ)	ND	20	ug/kg	7.0
PCB 105 (BZ)	ND	20	ug/kg	11
PCB 118 (BZ)	ND	20	ug/kg	8.6
PCB 126 (BZ)	ND	20	ug/kg	9.9
PCB 128 (BZ)	ND	20	ug/kg	8.6
PCB 138 (BZ)	ND	20	ug/kg	6.9
PCB 153 (BZ)	ND	20	ug/kg	7.4
PCB 156 (BZ)	ND	20	ug/kg	8.8
PCB 169 (BZ)	ND	20	ug/kg	9.2
PCB 170 (BZ)	ND	20	ug/kg	8.4
PCB 180 (BZ)	ND	20	ug/kg	8.0
PCB 183 (BZ)	ND	20	ug/kg	8.2
PCB 184 (BZ)	ND	20	ug/kg	10
PCB 187 (BZ)	ND	20	ug/kg	11
PCB 195 (BZ)	ND	20	ug/kg	10
PCB 206 (BZ)	ND	20	ug/kg	10
PCB 209 (BZ)	ND	20	ug/kg	9.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650E-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-026	Work Order #...:	L9QWF1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	00:10		
Dilution Factor:	1	Initial Wgt/Vol:	1.5 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	91	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	22	ug/kg	10
PCB 18 (BZ)	ND	22	ug/kg	7.5
PCB 28 (BZ)	ND	22	ug/kg	9.4
PCB 44 (BZ)	ND	22	ug/kg	10
PCB 49 (BZ)	ND	22	ug/kg	11
PCB 52 (BZ)	ND	22	ug/kg	11
PCB 66 (BZ)	ND	22	ug/kg	9.4
PCB 77 (BZ)	ND	22	ug/kg	9.1
PCB 87 (BZ)	ND	22	ug/kg	9.4
PCB 90 (BZ)	ND	22	ug/kg	11
PCB 101 (BZ)	ND	22	ug/kg	7.7
PCB 105 (BZ)	ND	22	ug/kg	12
PCB 118 (BZ)	ND	22	ug/kg	9.5
PCB 126 (BZ)	ND	22	ug/kg	11
PCB 128 (BZ)	ND	22	ug/kg	9.5
PCB 138 (BZ)	ND	22	ug/kg	7.5
PCB 153 (BZ)	ND	22	ug/kg	8.2
PCB 156 (BZ)	ND	22	ug/kg	9.7
PCB 169 (BZ)	ND	22	ug/kg	10
PCB 170 (BZ)	ND	22	ug/kg	9.2
PCB 180 (BZ)	ND	22	ug/kg	8.8
PCB 183 (BZ)	ND	22	ug/kg	9.0
PCB 184 (BZ)	ND	22	ug/kg	11
PCB 187 (BZ)	ND	22	ug/kg	12
PCB 195 (BZ)	ND	22	ug/kg	11
PCB 206 (BZ)	ND	22	ug/kg	11
PCB 209 (BZ)	ND	22	ug/kg	10

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683A-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-027	Work Order #...:	L9QWG1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	00:35		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	89	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	18	ug/kg	8.3
PCB 18 (BZ)	ND	18	ug/kg	6.2
PCB 28 (BZ)	ND	18	ug/kg	7.7
PCB 44 (BZ)	ND	18	ug/kg	8.5
PCB 49 (BZ)	ND	18	ug/kg	8.9
PCB 52 (BZ)	ND	18	ug/kg	8.8
PCB 66 (BZ)	ND	18	ug/kg	7.7
PCB 77 (BZ)	ND	18	ug/kg	7.5
PCB 87 (BZ)	ND	18	ug/kg	7.7
PCB 90 (BZ)	ND	18	ug/kg	9.2
PCB 101 (BZ)	ND	18	ug/kg	6.3
PCB 105 (BZ)	ND	18	ug/kg	9.7
PCB 118 (BZ)	ND	18	ug/kg	7.8
PCB 126 (BZ)	ND	18	ug/kg	8.9
PCB 128 (BZ)	ND	18	ug/kg	7.8
PCB 138 (BZ)	ND	18	ug/kg	6.2
PCB 153 (BZ)	ND	18	ug/kg	6.7
PCB 156 (BZ)	ND	18	ug/kg	7.9
PCB 169 (BZ)	ND	18	ug/kg	8.3
PCB 170 (BZ)	ND	18	ug/kg	7.6
PCB 180 (BZ)	ND	18	ug/kg	7.2
PCB 183 (BZ)	ND	18	ug/kg	7.4
PCB 184 (BZ)	ND	18	ug/kg	9.4
PCB 187 (BZ)	ND	18	ug/kg	9.6
PCB 195 (BZ)	ND	18	ug/kg	9.2
PCB 206 (BZ)	ND	18	ug/kg	9.4
PCB 209 (BZ)	ND	18	ug/kg	8.2

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	42	(35 - 140)
PCB 205 (BZ)	38	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683B-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-028	**Work Order #...:**	L9QWH1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0327022
Prep Date.....:	11/23/10	**Analysis Date..:**	11/26/10		
Prep Batch #...:	0327041	**Analysis Time..:**	01:00		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.5 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	89	**Analyst ID.....:**	401414	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	18	ug/kg	8.3
PCB 18 (BZ)	ND	18	ug/kg	6.2
PCB 28 (BZ)	ND	18	ug/kg	7.7
PCB 44 (BZ)	ND	18	ug/kg	8.5
PCB 49 (BZ)	ND	18	ug/kg	9.0
PCB 52 (BZ)	ND	18	ug/kg	8.9
PCB 66 (BZ)	ND	18	ug/kg	7.8
PCB 77 (BZ)	ND	18	ug/kg	7.5
PCB 87 (BZ)	ND	18	ug/kg	7.8
PCB 90 (BZ)	ND	18	ug/kg	9.2
PCB 101 (BZ)	ND	18	ug/kg	6.4
PCB 105 (BZ)	ND	18	ug/kg	9.8
PCB 118 (BZ)	ND	18	ug/kg	7.8
PCB 126 (BZ)	ND	18	ug/kg	9.0
PCB 128 (BZ)	ND	18	ug/kg	7.8
PCB 138 (BZ)	ND	18	ug/kg	6.2
PCB 153 (BZ)	ND	18	ug/kg	6.7
PCB 156 (BZ)	ND	18	ug/kg	8.0
PCB 169 (BZ)	ND	18	ug/kg	8.3
PCB 170 (BZ)	ND	18	ug/kg	7.6
PCB 180 (BZ)	ND	18	ug/kg	7.3
PCB 183 (BZ)	ND	18	ug/kg	7.5
PCB 184 (BZ)	ND	18	ug/kg	9.5
PCB 187 (BZ)	ND	18	ug/kg	9.6
PCB 195 (BZ)	ND	18	ug/kg	9.3
PCB 206 (BZ)	ND	18	ug/kg	9.5
PCB 209 (BZ)	ND	18	ug/kg	8.2

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683C-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-029	Work Order #...:	L9QWJ1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	01:25		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	93	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	27	ug/kg	12
PCB 18 (BZ)	ND	27	ug/kg	9.1
PCB 28 (BZ)	ND	27	ug/kg	11
PCB 44 (BZ)	ND	27	ug/kg	12
PCB 49 (BZ)	ND	27	ug/kg	13
PCB 52 (BZ)	ND	27	ug/kg	13
PCB 66 (BZ)	ND	27	ug/kg	11
PCB 77 (BZ)	ND	27	ug/kg	11
PCB 87 (BZ)	ND	27	ug/kg	11
PCB 90 (BZ)	ND	27	ug/kg	13
PCB 101 (BZ)	ND	27	ug/kg	9.3
PCB 105 (BZ)	ND	27	ug/kg	14
PCB 118 (BZ)	ND	27	ug/kg	11
PCB 126 (BZ)	ND	27	ug/kg	13
PCB 128 (BZ)	ND	27	ug/kg	11
PCB 138 (BZ)	ND	27	ug/kg	9.1
PCB 153 (BZ)	ND	27	ug/kg	9.8
PCB 156 (BZ)	ND	27	ug/kg	12
PCB 169 (BZ)	ND	27	ug/kg	12
PCB 170 (BZ)	ND	27	ug/kg	11
PCB 180 (BZ)	ND	27	ug/kg	11
PCB 183 (BZ)	ND	27	ug/kg	11
PCB 184 (BZ)	ND	27	ug/kg	14
PCB 187 (BZ)	ND	27	ug/kg	14
PCB 195 (BZ)	ND	27	ug/kg	14
PCB 206 (BZ)	ND	27	ug/kg	14
PCB 209 (BZ)	ND	27	ug/kg	12

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	47	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTA-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-030	Work Order #...:	L9QWK1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	01:50		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	88	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	16	ug/kg	7.3
PCB 18 (BZ)	ND	16	ug/kg	5.4
PCB 28 (BZ)	ND	16	ug/kg	6.8
PCB 44 (BZ)	ND	16	ug/kg	7.4
PCB 49 (BZ)	ND	16	ug/kg	7.8
PCB 52 (BZ)	ND	16	ug/kg	7.7
PCB 66 (BZ)	ND	16	ug/kg	6.8
PCB 77 (BZ)	ND	16	ug/kg	6.6
PCB 87 (BZ)	ND	16	ug/kg	6.8
PCB 90 (BZ)	ND	16	ug/kg	8.1
PCB 101 (BZ)	ND	16	ug/kg	5.5
PCB 105 (BZ)	ND	16	ug/kg	8.6
PCB 118 (BZ)	ND	16	ug/kg	6.8
PCB 126 (BZ)	ND	16	ug/kg	7.9
PCB 128 (BZ)	ND	16	ug/kg	6.8
PCB 138 (BZ)	ND	16	ug/kg	5.4
PCB 153 (BZ)	ND	16	ug/kg	5.9
PCB 156 (BZ)	ND	16	ug/kg	7.0
PCB 169 (BZ)	ND	16	ug/kg	7.3
PCB 170 (BZ)	ND	16	ug/kg	6.6
PCB 180 (BZ)	ND	16	ug/kg	6.3
PCB 183 (BZ)	ND	16	ug/kg	6.5
PCB 184 (BZ)	ND	16	ug/kg	8.3
PCB 187 (BZ)	ND	16	ug/kg	8.4
PCB 195 (BZ)	ND	16	ug/kg	8.1
PCB 206 (BZ)	ND	16	ug/kg	8.3
PCB 209 (BZ)	ND	16	ug/kg	7.2

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTB-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-031	Work Order #...:	L9QWL1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	02:16		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	88	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	17	ug/kg	7.6
PCB 18 (BZ)	ND	17	ug/kg	5.7
PCB 28 (BZ)	ND	17	ug/kg	7.1
PCB 44 (BZ)	ND	17	ug/kg	7.8
PCB 49 (BZ)	ND	17	ug/kg	8.2
PCB 52 (BZ)	ND	17	ug/kg	8.1
PCB 66 (BZ)	ND	17	ug/kg	7.1
PCB 77 (BZ)	ND	17	ug/kg	6.9
PCB 87 (BZ)	ND	17	ug/kg	7.1
PCB 90 (BZ)	ND	17	ug/kg	8.5
PCB 101 (BZ)	ND	17	ug/kg	5.8
PCB 105 (BZ)	ND	17	ug/kg	9.0
PCB 118 (BZ)	**7.7 ~~J, PG~~ J**	**17**	**ug/kg**	**7.2**
PCB 126 (BZ)	ND	17	ug/kg	8.2
PCB 128 (BZ)	**14 J**	**17**	**ug/kg**	**7.2**
PCB 138 (BZ)	**18 ~~PG~~ J**	**17**	**ug/kg**	**5.7**
PCB 153 (BZ)	**26**	**17**	**ug/kg**	**6.2**
PCB 156 (BZ)	ND	17	ug/kg	7.3
PCB 169 (BZ)	ND	17	ug/kg	7.6
PCB 170 (BZ)	**24 J**	**17**	**ug/kg**	**7.0**
PCB 180 (BZ)	**20**	**17**	**ug/kg**	**6.7**
PCB 183 (BZ)	ND	17	ug/kg	6.8
PCB 184 (BZ)	ND	17	ug/kg	8.7
PCB 187 (BZ)	**34 J**	**17**	**ug/kg**	**8.8**
PCB 195 (BZ)	ND	17	ug/kg	8.5
PCB 206 (BZ)	ND	17	ug/kg	8.7
PCB 209 (BZ)	ND	17	ug/kg	7.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	49	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTC-C

GC Semivolatiles

Lot-Sample #...:	C0K090449-032	Work Order #...:	L9QWP1AH	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0327022
Prep Date.....:	11/23/10	Analysis Date..:	11/26/10		
Prep Batch #...:	0327041	Analysis Time..:	02:40		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	86	Analyst ID.....:	401414	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	15	ug/kg	6.6
PCB 18 (BZ)	ND	15	ug/kg	4.9
PCB 28 (BZ)	ND	15	ug/kg	6.1
PCB 44 (BZ)	ND	15	ug/kg	6.7
PCB 49 (BZ)	ND	15	ug/kg	7.1
PCB 52 (BZ)	ND	15	ug/kg	7.0
PCB 66 (BZ)	ND	15	ug/kg	6.1
PCB 77 (BZ)	ND	15	ug/kg	5.9
PCB 87 (BZ)	ND	15	ug/kg	6.1
PCB 90 (BZ)	ND	15	ug/kg	7.3
PCB 101 (BZ)	ND	15	ug/kg	5.0
PCB 105 (BZ)	ND	15	ug/kg	7.7
PCB 118 (BZ)	ND	15	ug/kg	6.2
PCB 126 (BZ)	ND	15	ug/kg	7.1
PCB 128 (BZ)	ND	15	ug/kg	6.2
PCB 138 (BZ)	ND	15	ug/kg	4.9
PCB 153 (BZ)	ND	15	ug/kg	5.3
PCB 156 (BZ)	ND	15	ug/kg	6.3
PCB 169 (BZ)	ND	15	ug/kg	6.6
PCB 170 (BZ)	ND	15	ug/kg	6.0
PCB 180 (BZ)	ND	15	ug/kg	5.7
PCB 183 (BZ)	ND	15	ug/kg	5.9
PCB 184 (BZ)	ND	15	ug/kg	7.5
PCB 187 (BZ)	ND	15	ug/kg	7.6
PCB 195 (BZ)	ND	15	ug/kg	7.4
PCB 206 (BZ)	ND	15	ug/kg	7.5
PCB 209 (BZ)	ND	15	ug/kg	6.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	45	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

GC Semivolatiles

Lot-Sample #...:	C0K090449-033	**Work Order #...:**	L9RJP1AC	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	
Prep Date.....:	11/23/10	**Analysis Date..:**	11/26/10		
Prep Batch #...:	0327035	**Analysis Time..:**	04:21		
Dilution Factor:	12	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:		**Analyst ID.....:**	401414	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB [illegible]	3000	24 m 12/10/10	ug/kg	11
PCB 18 (BZ)	4000	24	ug/kg	8.1
PCB 28 (BZ)	3300	24	ug/kg	10
PCB 44 (BZ)	1000	24	ug/kg	11
PCB 49 (BZ)	2700	24	ug/kg	12
PCB 52 (BZ)	2300	24	ug/kg	12
PCB 66 (BZ)	ND	24	ug/kg	10
PCB 77 (BZ)	ND	24	ug/kg	9.8
PCB 87 (BZ)	170	24	ug/kg	10
PCB 90 (BZ)	130 ~~PG~~ J	24	ug/kg	12
PCB 101 (BZ)	200 ~~PG~~ J	24	ug/kg	8.3
PCB 105 (BZ)	140	24	ug/kg	13
PCB 118 (BZ)	140 ~~PG~~ J	24	ug/kg	10
PCB 126 (BZ)	ND	24	ug/kg	12
PCB 128 (BZ)	98	24	ug/kg	10
PCB 138 (BZ)	190 ~~PG~~ J	24	ug/kg	8.1
PCB 153 (BZ)	210	24	ug/kg	8.7
PCB 156 (BZ)	45 ~~PG~~ J	24	ug/kg	10
PCB 169 (BZ)	ND	24	ug/kg	11
PCB 170 (BZ)	96	24	ug/kg	9.9
PCB 180 (BZ)	65 ~~PG~~ J	24	ug/kg	9.4
PCB 183 (BZ)	46 J	24	ug/kg	9.7
PCB 184 (BZ)	ND	24	ug/kg	12
PCB 187 (BZ)	120	24	ug/kg	12
PCB 195 (BZ)	15 J	24	ug/kg	12
PCB 206 (BZ)	28	24	ug/kg	12
PCB 209 (BZ)	ND	24	ug/kg	11

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	NC,DIL	(35 - 140)
PCB 205 (BZ)	NC,DIL	(35 - 140)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW 12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

GC Semivolatiles

Lot-Sample #...:	C0K090449-034	**Work Order #...:**	L9RJQ1AC	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	
Prep Date.....:	11/23/10	**Analysis Date..:**	11/26/10		
Prep Batch #...:	0327035	**Analysis Time..:**	05:11		
Dilution Factor:	12	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:		**Analyst ID.....:**	401414	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	3100 J	24	ug/kg	11
PCB 18 (BZ)	**4300**	**24**	**ug/kg**	**8.1**
PCB 28 (BZ)	**3500**	**24**	**ug/kg**	**10**
PCB 44 (BZ)	**1000**	**24**	**ug/kg**	**11**
PCB 49 (BZ)	**2800**	**24**	**ug/kg**	**12**
PCB 52 (BZ)	**2300**	**24**	**ug/kg**	**12**
PCB 66 (BZ)	ND	24	ug/kg	10
PCB 77 (BZ)	ND	24	ug/kg	9.8
PCB 87 (BZ)	**170**	**24**	**ug/kg**	**10**
PCB 90 (BZ)	**130 ~~PG~~ J**	**24**	**ug/kg**	**12**
PCB 101 (BZ)	**300 J**	**24**	**ug/kg**	**8.3**
PCB 105 (BZ)	**150**	**24**	**ug/kg**	**13**
PCB 118 (BZ)	**150 ~~PG~~ J**	**24**	**ug/kg**	**10**
PCB 126 (BZ)	ND	24	ug/kg	12
PCB 128 (BZ)	**100**	**24**	**ug/kg**	**10**
PCB 138 (BZ)	**180 ~~PG~~ J**	**24**	**ug/kg**	**8.1**
PCB 153 (BZ)	**210**	**24**	**ug/kg**	**8.7**
PCB 156 (BZ)	**48 ~~PG~~ J**	**24**	**ug/kg**	**10**
PCB 169 (BZ)	ND	24	ug/kg	11
PCB 170 (BZ)	**100**	**24**	**ug/kg**	**9.9**
PCB 180 (BZ)	**96 J**	**24**	**ug/kg**	**9.4**
PCB 183 (BZ)	**26 ~~PG~~ J**	**24**	**ug/kg**	**9.7**
PCB 184 (BZ)	ND	24	ug/kg	12
PCB 187 (BZ)	**120**	**24**	**ug/kg**	**12**
PCB 195 (BZ)	**16 J**	**24**	**ug/kg**	**12**
PCB 206 (BZ)	**29**	**24**	**ug/kg**	**12**
PCB 209 (BZ)	ND	24	ug/kg	11

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	NC,DIL	(35 - 140)
PCB 205 (BZ)	NC,DIL	(35 - 140)

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

vm 12/10/10

MW 12/17/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS (PAH ONLY)

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0K090449

Client: Maryland Environmental Service, Millersville, MD Date: December 17, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	AT0-649A-W	C0K090449-001	Tissue
1MS	AT0-649A-WMS	C0K090449-001MS	Tissue
1MSD	AT0-649A-WMSD	C0K090449-001MSD	Tissue
2	AT0-649B-W	C0K090449-002	Tissue
3	AT0-649C-W	C0K090449-003	Tissue
4	AT0-649D-W	C0K090449-004	Tissue
5	AT0-649E-W	C0K090449-005	Tissue
6	AT0-650A-W	C0K090449-006	Tissue
7	AT0-650B-W	C0K090449-007	Tissue
8	AT0-650C-W	C0K090449-008	Tissue
9	AT0-650D-W	C0K090449-009	Tissue
10	AT0-650E-W	C0K090449-010	Tissue
11	AT0-682A-W	C0K090449-011	Tissue
12	AT0-682B-W	C0K090449-012	Tissue
13	AT0-682C-W	C0K090449-013	Tissue
14	PRETEST A-W	C0K090449-014	Tissue
15	PRETEST B-W	C0K090449-015	Tissue
16	PRETEST C-W	C0K090449-016	Tissue
17	AT0-649A-C	C0K090449-017	Tissue
17MS	AT0-649A-CMS	C0K090449-017MS	Tissue
17MSD	AT0-649A-CMSD	C0K090449-017MSD	Tissue
18	AT0-649B-C	C0K090449-018	Tissue
19	AT0-649C-C	C0K090449-019	Tissue
20	AT0-649D-C	C0K090449-020	Tissue
21	AT0-649E-C	C0K090449-021	Tissue
22	AT0-650A-C	C0K090449-022	Tissue
23	AT0-650B-C	C0K090449-023	Tissue
24	AT0-650C-C	C0K090449-024	Tissue
25	AT0-650D-C	C0K090449-025	Tissue
26	AT0-650E-C	C0K090449-026	Tissue
27	AT0-683A-C	C0K090449-027	Tissue
28	AT0-683B-C	C0K090449-028	Tissue
29	AT0-683C-C	C0K090449-029	Tissue
30	PRETESTA-C	C0K090449-030	Tissue
31	PRETESTB-C	C0K090449-031	Tissue

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
32	PRETESTC-C	C0K090449-032	Tissue
33	SRM	C0K090449-033	Tissue
34	SRM	C0K090449-034	Tissue

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 14 days for tissue samples and analyzed within 40 days for all samples.

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
13	S2= Terphenyl-d14	171%	None for one out per fraction
28	S2= Terphenyl-d14	140%	
33	S3= 2-Fluorobiphenyl	113%	
34	S1= Nitrobenzene-d5	41%	

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
1	Naphthalene	OK/OK/32	None for RPD alone
17	Pyrene	193%/OK/OK	None- See Internal Standards

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria except the following.

Sample ID	Internal Standard	Area Count	Qualifier
1	IS2= Chrysene-d12	Low	J/UJ- All associated compounds
2	IS2= Chrysene-d12	Low	
3	IS2= Chrysene-d12	Low	
4	IS2= Chrysene-d12	Low	
5	IS2= Chrysene-d12	Low	
6	IS2= Chrysene-d12	Low	
7	IS2= Chrysene-d12	Low	
8	IS2= Chrysene-d12	Low	
9	IS2= Chrysene-d12	Low	
10	IS2= Chrysene-d12	Low	
11	IS2= Chrysene-d12	Low	
12	IS2= Chrysene-d12	Low	
13	IS2= Chrysene-d12	Low	
14	IS2= Chrysene-d12	Low	
15	IS2= Chrysene-d12	Low	
16	IS2= Chrysene-d12	Low	
17	IS2= Chrysene-d12	Low	
18	IS2= Chrysene-d12	Low	
19	IS2= Chrysene-d12	Low	
20	IS2= Chrysene-d12	Low	
21	IS2= Chrysene-d12	Low	
22	IS2= Chrysene-d12	Low	
24	IS2= Chrysene-d12	Low	
26	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
27	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
28	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
29	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS4= Acenaphthene-d10	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
30	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
31	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
	IS4= Acenaphthene-d10	Low	
	IS5= Naphthalene-d8	Low	
	IS6= 1,4-Dichlorobenzene-d4	Low	
32	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	

Sample ID	Internal Standard	Area Count	Qualifier
32	IS5= Naphthalene-d8	Low	J/UJ- All associated compounds
	IS6= 1,4-Dichlorobenzene-d4	Low	
33	IS1= Phenanthrene-d10	Low	
	IS2= Chrysene-d12	Low	
34	IS2= Chrysene-d12	Low	
	IS3= Perylene-d12	Low	

Method Blank - The method blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - Several samples were analyzed at various dilutions due to high concentrations of target compounds.

Two standard reference material (SRM) QC samples were analyzed in this data package.

EA Engineering, Science and Technology

Client Sample ID: AT0-649A-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-001	**Work Order #...:**	L9QR71AA	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	14:02		
Dilution Factor:	7.5	**Initial Wgt/Vol:**	20 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	**440**	**340**	**ug/kg**	**68**
Benzo(ghi)perylene	**240 J**	**340**	**ug/kg**	**33**
Benzo(a)pyrene	**1600**	**340**	**ug/kg**	**33**
Chrysene	**2000 J**	**340**	**ug/kg**	**40**
Dibenz(a,h)anthracene	**900**	**340**	**ug/kg**	**37**
Fluoranthene	**5300 J**	**340**	**ug/kg**	**36**
Fluorene	ND	340	ug/kg	44
Indeno(1,2,3-cd)pyrene	**870**	**340**	**ug/kg**	**34**
Naphthalene	**1400**	**340**	**ug/kg**	**29**
Phenanthrene	**670**	**340**	**ug/kg**	**53**
Pyrene	**2600 J**	**340**	**ug/kg**	**34**
2-Methylnaphthalene	ND	340	ug/kg	30
1-Methylnaphthalene	ND	340	ug/kg	36
Acenaphthene	**190 J**	**340**	**ug/kg**	**32**
Acenaphthylene	**310 J**	**340**	**ug/kg**	**38**
Anthracene	**490**	**340**	**ug/kg**	**33**
Benzo(a)anthracene	**1100 J**	**340**	**ug/kg**	**42**
Benzo(b)fluoranthene	**630**	**340**	**ug/kg**	**53**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	61	(42 - 110)
Terphenyl-d14	98	(37 - 137)
2-Fluorobiphenyl	75	(43 - 110)
2-Fluorophenol	54	(11 - 116)
Phenol-d5	72	(25 - 115)
2,4,6-Tribromophenol	81	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649B-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-002	Work Order #...:	L9QTT1AG	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	0326033
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326048	Analysis Time..:	15:03		
Dilution Factor:	6	Initial Wgt/Vol:	25 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	84	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	410	250	ug/kg	50
Benzo(ghi)perylene	150 J	250	ug/kg	25
Benzo(a)pyrene	1300	250	ug/kg	25
Chrysene	2100 J	250	ug/kg	30
Dibenz(a,h)anthracene	660	250	ug/kg	28
Fluoranthene	5800 J	250	ug/kg	27
Fluorene	81 J	250	ug/kg	33
Indeno(1,2,3-cd)pyrene	640	250	ug/kg	26
Naphthalene	1400	250	ug/kg	21
Phenanthrene	510	250	ug/kg	40
Pyrene	2700 J	250	ug/kg	25
2-Methylnaphthalene	98 J	250	ug/kg	22
1-Methylnaphthalene	88 J	250	ug/kg	27
Acenaphthene	280	250	ug/kg	24
Acenaphthylene	140 J	250	ug/kg	28
Anthracene	430	250	ug/kg	24
Benzo(a)anthracene	1100 J	250	ug/kg	31
Benzo(b)fluoranthene	460	250	ug/kg	39

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(42 - 110)
Terphenyl-d14	94	(37 - 137)
2-Fluorobiphenyl	79	(43 - 110)
2-Fluorophenol	65	(11 - 116)
Phenol-d5	78	(25 - 115)
2,4,6-Tribromophenol	94	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649C-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-003	Work Order #...:	L9QTV1AG	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	0326033
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326048	Analysis Time..:	15:23		
Dilution Factor:	6	Initial Wgt/Vol:	25 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	85	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	450	280	ug/kg	56
Benzo(ghi)perylene	130 J	280	ug/kg	27
Benzo(a)pyrene	1300	280	ug/kg	27
Chrysene	1900 J	280	ug/kg	33
Dibenz(a,h)anthracene	720	280	ug/kg	31
Fluoranthene	4700 J	280	ug/kg	29
Fluorene	ND	280	ug/kg	36
Indeno(1,2,3-cd)pyrene	680	280	ug/kg	28
Naphthalene	400	280	ug/kg	24
Phenanthrene	360	280	ug/kg	44
Pyrene	2100 J	280	ug/kg	28
2-Methylnaphthalene	ND	280	ug/kg	25
1-Methylnaphthalene	ND	280	ug/kg	29
Acenaphthene	140 J	280	ug/kg	26
Acenaphthylene	97 J	280	ug/kg	31
Anthracene	290	280	ug/kg	27
Benzo(a)anthracene	940 J	280	ug/kg	34
Benzo(b)fluoranthene	480	280	ug/kg	43

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	85	(42 - 110)
Terphenyl-d14	104	(37 - 137)
2-Fluorobiphenyl	91	(43 - 110)
2-Fluorophenol	77	(11 - 116)
Phenol-d5	94	(25 - 115)
2,4,6-Tribromophenol	110	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649D-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-004	**Work Order #...:**	L9QTW1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	15:44		
Dilution Factor:	5.98	**Initial Wgt/Vol:**	25.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	**270**	**270**	**ug/kg**	**54**
Benzo(ghi)perylene	**140 J**	**270**	**ug/kg**	**26**
Benzo(a)pyrene	**1100**	**270**	**ug/kg**	**27**
Chrysene	**1400 J**	**270**	**ug/kg**	**32**
Dibenz(a,h)anthracene	**710**	**270**	**ug/kg**	**30**
Fluoranthene	**3700 J**	**270**	**ug/kg**	**28**
Fluorene	ND	270	ug/kg	35
Indeno(1,2,3-cd)pyrene	**670**	**270**	**ug/kg**	**27**
Naphthalene	**1100**	**270**	**ug/kg**	**23**
Phenanthrene	**470**	**270**	**ug/kg**	**42**
Pyrene	**1700 J**	**270**	**ug/kg**	**27**
2-Methylnaphthalene	ND	270	ug/kg	24
1-Methylnaphthalene	**32 J**	**270**	**ug/kg**	**28**
Acenaphthene	**150 J**	**270**	**ug/kg**	**25**
Acenaphthylene	ND	270	ug/kg	30
Anthracene	**280**	**270**	**ug/kg**	**26**
Benzo(a)anthracene	**790 J**	**270**	**ug/kg**	**33**
Benzo(b)fluoranthene	**400**	**270**	**ug/kg**	**42**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	87	(42 - 110)
Terphenyl-d14	101	(37 - 137)
2-Fluorobiphenyl	93	(43 - 110)
2-Fluorophenol	77	(11 - 116)
Phenol-d5	93	(25 - 115)
2,4,6-Tribromophenol	109	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-649E-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-005	Work Order #...:	L9QT01AG	Matrix.....:	BIOLOGIC
Date Sampled...:	11/03/10	Date Received..:	11/09/10	MS Run #.....:	0326033
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326048	Analysis Time..:	16:04		
Dilution Factor:	5.95	Initial Wgt/Vol:	25.2 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	83	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	240	240	ug/kg	48
Benzo(ghi)perylene	66 J	240	ug/kg	24
Benzo(a)pyrene	950	240	ug/kg	24
Chrysene	1300 J	240	ug/kg	28
Dibenz(a,h)anthracene	ND	240	ug/kg	26
Fluoranthene	3700 J	240	ug/kg	25
Fluorene	ND	240	ug/kg	31
Indeno(1,2,3-cd)pyrene	570	240	ug/kg	25
Naphthalene	88 J	240	ug/kg	21
Phenanthrene	570	240	ug/kg	38
Pyrene	1600 J	240	ug/kg	24
2-Methylnaphthalene	ND	240	ug/kg	21
1-Methylnaphthalene	ND	240	ug/kg	25
Acenaphthene	150 J	240	ug/kg	23
Acenaphthylene	67 J	240	ug/kg	27
Anthracene	320	240	ug/kg	23
Benzo(a)anthracene	630 J	240	ug/kg	30
Benzo(b)fluoranthene	270	240	ug/kg	37

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	76	(42 - 110)
Terphenyl-d14	98	(37 - 137)
2-Fluorobiphenyl	82	(43 - 110)
2-Fluorophenol	66	(11 - 116)
Phenol-d5	80	(25 - 115)
2,4,6-Tribromophenol	105	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650A-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-006	**Work Order #...:**	L9QT11AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	16:24		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	83	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	240	ug/kg	49
Benzo(ghi)perylene	ND	240	ug/kg	24
Benzo(a)pyrene	ND	240	ug/kg	24
Chrysene	~~ND~~ UJ	240	ug/kg	29
Dibenz(a,h)anthracene	ND	240	ug/kg	27
Fluoranthene	~~ND~~ UJ	240	ug/kg	26
Fluorene	ND	240	ug/kg	32
Indeno(1,2,3-cd)pyrene	ND	240	ug/kg	25
Naphthalene	ND	240	ug/kg	21
Phenanthrene	ND	240	ug/kg	38
Pyrene	~~ND~~ UJ	240	ug/kg	24
2-Methylnaphthalene	ND	240	ug/kg	22
1-Methylnaphthalene	ND	240	ug/kg	26
Acenaphthene	ND	240	ug/kg	23
Acenaphthylene	ND	240	ug/kg	28
Anthracene	ND	240	ug/kg	23
Benzo(a)anthracene	~~ND~~ UJ	240	ug/kg	30
Benzo(b)fluoranthene	ND	240	ug/kg	38

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	81	(42 - 110)
Terphenyl-d14	84	(37 - 137)
2-Fluorobiphenyl	93	(43 - 110)
2-Fluorophenol	77	(11 - 116)
Phenol-d5	95	(25 - 115)
2,4,6-Tribromophenol	108	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650B-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-007	**Work Order #...:**	L9QT31AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	16:44		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	270	ug/kg	54
Benzo(ghi)perylene	ND	270	ug/kg	27
Benzo(a)pyrene	ND	270	ug/kg	27
Chrysene	~~ND~~ UJ	270	ug/kg	32
Dibenz(a,h)anthracene	ND	270	ug/kg	30
Fluoranthene	~~ND~~ UJ	270	ug/kg	29
Fluorene	ND	270	ug/kg	35
Indeno(1,2,3-cd)pyrene	ND	270	ug/kg	27
Naphthalene	ND	270	ug/kg	23
Phenanthrene	ND	270	ug/kg	42
Pyrene	~~ND~~ UJ	270	ug/kg	27
2-Methylnaphthalene	ND	270	ug/kg	24
1-Methylnaphthalene	ND	270	ug/kg	28
Acenaphthene	ND	270	ug/kg	26
Acenaphthylene	ND	270	ug/kg	31
Anthracene	ND	270	ug/kg	26
Benzo(a)anthracene	~~ND~~ UJ	270	ug/kg	33
Benzo(b)fluoranthene	ND	270	ug/kg	42

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	83	(42 - 110)
Terphenyl-d14	86	(37 - 137)
2-Fluorobiphenyl	79	(43 - 110)
2-Fluorophenol	69	(11 - 116)
Phenol-d5	80	(25 - 115)
2,4,6-Tribromophenol	97	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650C-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-008	**Work Order #...:**	L9QT51AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	17:04		
Dilution Factor:	5.98	**Initial Wgt/Vol:**	25.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	270	ug/kg	54
Benzo(ghi)perylene	ND	270	ug/kg	27
Benzo(a)pyrene	ND	270	ug/kg	27
Chrysene	~~ND~~ UJ	270	ug/kg	32
Dibenz(a,h)anthracene	ND	270	ug/kg	30
Fluoranthene	~~ND~~ UJ	270	ug/kg	29
Fluorene	ND	270	ug/kg	35
Indeno(1,2,3-cd)pyrene	ND	270	ug/kg	28
Naphthalene	ND	270	ug/kg	23
Phenanthrene	ND	270	ug/kg	43
Pyrene	~~ND~~ UJ	270	ug/kg	27
2-Methylnaphthalene	ND	270	ug/kg	24
1-Methylnaphthalene	ND	270	ug/kg	29
Acenaphthene	ND	270	ug/kg	26
Acenaphthylene	ND	270	ug/kg	31
Anthracene	ND	270	ug/kg	26
Benzo(a)anthracene	~~ND~~ UJ	270	ug/kg	34
Benzo(b)fluoranthene	ND	270	ug/kg	42

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	83	(42 - 110)
Terphenyl-d14	93	(37 - 137)
2-Fluorobiphenyl	93	(43 - 110)
2-Fluorophenol	72	(11 - 116)
Phenol-d5	90	(25 - 115)
2,4,6-Tribromophenol	103	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650D-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-009	**Work Order #...:**	L9QT61AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	17:24		
Dilution Factor:	5.95	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	260	ug/kg	52
Benzo(ghi)perylene	ND	260	ug/kg	26
Benzo(a)pyrene	ND	260	ug/kg	26
Chrysene	~~ND~~ UJ	260	ug/kg	31
Dibenz(a,h)anthracene	ND	260	ug/kg	29
Fluoranthene	~~ND~~ UJ	260	ug/kg	28
Fluorene	ND	260	ug/kg	34
Indeno(1,2,3-cd)pyrene	ND	260	ug/kg	27
Naphthalene	ND	260	ug/kg	22
Phenanthrene	ND	260	ug/kg	41
Pyrene	~~ND~~ UJ	260	ug/kg	26
2-Methylnaphthalene	ND	260	ug/kg	23
1-Methylnaphthalene	ND	260	ug/kg	28
Acenaphthene	ND	260	ug/kg	25
Acenaphthylene	ND	260	ug/kg	30
Anthracene	ND	260	ug/kg	25
Benzo(a)anthracene	~~ND~~ UJ	260	ug/kg	32
Benzo(b)fluoranthene	ND	260	ug/kg	41

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	85	(42 - 110)
Terphenyl-d14	99	(37 - 137)
2-Fluorobiphenyl	90	(43 - 110)
2-Fluorophenol	76	(11 - 116)
Phenol-d5	91	(25 - 115)
2,4,6-Tribromophenol	108	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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EA Engineering, Science and Technology

Client Sample ID: AT0-650E-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-010	**Work Order #...:**	L9QVC1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	17:45		
Dilution Factor:	5.95	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	260	ug/kg	53
Benzo(ghi)perylene	ND	260	ug/kg	26
Benzo(a)pyrene	ND	260	ug/kg	26
Chrysene	~~ND~~ UJ	260	ug/kg	31
Dibenz(a,h)anthracene	ND	260	ug/kg	29
Fluoranthene	~~ND~~ UJ	260	ug/kg	28
Fluorene	ND	260	ug/kg	35
Indeno(1,2,3-cd)pyrene	ND	260	ug/kg	27
Naphthalene	ND	260	ug/kg	23
Phenanthrene	ND	260	ug/kg	42
Pyrene	~~ND~~ UJ	260	ug/kg	27
2-Methylnaphthalene	ND	260	ug/kg	24
1-Methylnaphthalene	ND	260	ug/kg	28
Acenaphthene	ND	260	ug/kg	25
Acenaphthylene	ND	260	ug/kg	30
Anthracene	ND	260	ug/kg	26
Benzo(a)anthracene	~~ND~~ UJ	260	ug/kg	33
Benzo(b)fluoranthene	ND	260	ug/kg	41

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	86	(42 - 110)
Terphenyl-d14	88	(37 - 137)
2-Fluorobiphenyl	89	(43 - 110)
2-Fluorophenol	74	(11 - 116)
Phenol-d5	90	(25 - 115)
2,4,6-Tribromophenol	105	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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EA Engineering, Science and Technology

Client Sample ID: AT0-682A-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-011	**Work Order #...:**	L9QVE1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	18:05		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	86	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	280	ug/kg	57
Benzo(ghi)perylene	ND	280	ug/kg	28
Benzo(a)pyrene	ND	280	ug/kg	28
Chrysene	~~ND~~ UJ	280	ug/kg	34
Dibenz(a,h)anthracene	ND	280	ug/kg	32
Fluoranthene	~~ND~~ UJ	280	ug/kg	30
Fluorene	ND	280	ug/kg	37
Indeno(1,2,3-cd)pyrene	ND	280	ug/kg	29
Naphthalene	ND	280	ug/kg	24
Phenanthrene	ND	280	ug/kg	45
Pyrene	~~ND~~ UJ	280	ug/kg	29
2-Methylnaphthalene	ND	280	ug/kg	26
1-Methylnaphthalene	ND	280	ug/kg	30
Acenaphthene	ND	280	ug/kg	27
Acenaphthylene	ND	280	ug/kg	32
Anthracene	ND	280	ug/kg	28
Benzo(a)anthracene	~~ND~~ UJ	280	ug/kg	36
Benzo(b)fluoranthene	ND	280	ug/kg	45

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	81	(42 - 110)
Terphenyl-d14	83	(37 - 137)
2-Fluorobiphenyl	83	(43 - 110)
2-Fluorophenol	72	(11 - 116)
Phenol-d5	82	(25 - 115)
2,4,6-Tribromophenol	93	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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Client Sample ID: AT0-682B-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-012	**Work Order #...:**	L9QVJ1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	18:25		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	280	ug/kg	56
Benzo(ghi)perylene	ND	280	ug/kg	27
Benzo(a)pyrene	ND	280	ug/kg	28
Chrysene	~~ND~~ UJ	280	ug/kg	33
Dibenz(a,h)anthracene	ND	280	ug/kg	31
Fluoranthene	~~ND~~ UJ	280	ug/kg	29
Fluorene	ND	280	ug/kg	36
Indeno(1,2,3-cd)pyrene	ND	280	ug/kg	28
Naphthalene	ND	280	ug/kg	24
Phenanthrene	ND	280	ug/kg	44
Pyrene	~~ND~~ UJ	280	ug/kg	28
2-Methylnaphthalene	ND	280	ug/kg	25
1-Methylnaphthalene	ND	280	ug/kg	29
Acenaphthene	ND	280	ug/kg	26
Acenaphthylene	ND	280	ug/kg	32
Anthracene	ND	280	ug/kg	27
Benzo(a)anthracene	~~ND~~ UJ	280	ug/kg	35
Benzo(b)fluoranthene	ND	280	ug/kg	43

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	98	(42 - 110)
Terphenyl-d14	95	(37 - 137)
2-Fluorobiphenyl	105	(43 - 110)
2-Fluorophenol	89	(11 - 116)
Phenol-d5	100	(25 - 115)
2,4,6-Tribromophenol	120 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

KW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-682C-W

GC/MS Semivolatiles

Lot-Sample #...: C0K090449-013
Date Sampled...: 11/03/10
Prep Date.....: 11/22/10
Prep Batch #...: 0326048
Dilution Factor: 2.4
% Moisture.....: 84

Work Order #...: L9QVM1AG
Date Received..: 11/09/10
Analysis Date..: 11/30/10
Analysis Time..: 18:45
Initial Wgt/Vol: 25 g
Analyst ID.....: 430261
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0326033

Final Wgt/Vol..: 0.5 mL
Instrument ID..: 732

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	100	ug/kg	21
Benzo(ghi)perylene	ND	100	ug/kg	10
Benzo(a)pyrene	ND	100	ug/kg	10
Chrysene	~~ND~~ UJ	100	ug/kg	12
Dibenz(a,h)anthracene	ND	100	ug/kg	11
Fluoranthene	~~ND~~ UJ	100	ug/kg	11
Fluorene	ND	100	ug/kg	14
Indeno(1,2,3-cd)pyrene	ND	100	ug/kg	11
Naphthalene	ND	100	ug/kg	8.8
Phenanthrene	ND	100	ug/kg	16
Pyrene	~~ND~~ UJ	100	ug/kg	10
2-Methylnaphthalene	ND	100	ug/kg	9.2
1-Methylnaphthalene	ND	100	ug/kg	11
Acenaphthene	ND	100	ug/kg	9.8
Acenaphthylene	ND	100	ug/kg	12
Anthracene	ND	100	ug/kg	10
Benzo(a)anthracene	~~ND~~ UJ	100	ug/kg	13
Benzo(b)fluoranthene	ND	100	ug/kg	16

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	84	(42 - 110)
Terphenyl-d14	171 *	(37 - 137)
2-Fluorobiphenyl	94	(43 - 110)
2-Fluorophenol	72	(11 - 116)
Phenol-d5	86	(25 - 115)
2,4,6-Tribromophenol	117 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST A-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-014	**Work Order #...:**	L9QVP1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	19:06		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	100	ug/kg	21
Benzo(ghi)perylene	ND	100	ug/kg	10
Benzo(a)pyrene	ND	100	ug/kg	10
Chrysene	~~ND~~ UJ	100	ug/kg	12
Dibenz(a,h)anthracene	ND	100	ug/kg	12
Fluoranthene	~~ND~~ UJ	100	ug/kg	11
Fluorene	ND	100	ug/kg	14
Indeno(1,2,3-cd)pyrene	ND	100	ug/kg	11
Naphthalene	ND	100	ug/kg	8.9
Phenanthrene	ND	100	ug/kg	16
Pyrene	~~ND~~ UJ	100	ug/kg	10
2-Methylnaphthalene	ND	100	ug/kg	9.3
1-Methylnaphthalene	ND	100	ug/kg	11
Acenaphthene	ND	100	ug/kg	9.9
Acenaphthylene	ND	100	ug/kg	12
Anthracene	ND	100	ug/kg	10
Benzo(a)anthracene	~~ND~~ UJ	100	ug/kg	13
Benzo(b)fluoranthene	ND	100	ug/kg	16

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	71	(42 - 110)
Terphenyl-d14	110	(37 - 137)
2-Fluorobiphenyl	68	(43 - 110)
2-Fluorophenol	21	(11 - 116)
Phenol-d5	78	(25 - 115)
2,4,6-Tribromophenol	86	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

UJ
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST B-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-015	**Work Order #...:**	L9QVT1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	19:26		
Dilution Factor:	5.95	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	84	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	250	ug/kg	51
Benzo(ghi)perylene	ND	250	ug/kg	25
Benzo(a)pyrene	ND	250	ug/kg	25
Chrysene	~~ND~~ UJ	250	ug/kg	30
Dibenz(a,h)anthracene	ND	250	ug/kg	28
Fluoranthene	~~ND~~ UJ	250	ug/kg	27
Fluorene	ND	250	ug/kg	33
Indeno(1,2,3-cd)pyrene	ND	250	ug/kg	26
Naphthalene	ND	250	ug/kg	22
Phenanthrene	ND	250	ug/kg	40
Pyrene	~~ND~~ UJ	250	ug/kg	26
2-Methylnaphthalene	ND	250	ug/kg	23
1-Methylnaphthalene	ND	250	ug/kg	27
Acenaphthene	ND	250	ug/kg	24
Acenaphthylene	ND	250	ug/kg	29
Anthracene	ND	250	ug/kg	25
Benzo(a)anthracene	~~ND~~ UJ	250	ug/kg	32
Benzo(b)fluoranthene	ND	250	ug/kg	40

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	65	(42 - 110)
Terphenyl-d14	79	(37 - 137)
2-Fluorobiphenyl	78	(43 - 110)
2-Fluorophenol	73	(11 - 116)
Phenol-d5	76	(25 - 115)
2,4,6-Tribromophenol	101	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETEST C-W

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-016	**Work Order #...:**	L9QVW1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/03/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326033
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326048	**Analysis Time..:**	19:46		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	85	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	260	ug/kg	53
Benzo(ghi)perylene	ND	260	ug/kg	26
Benzo(a)pyrene	ND	260	ug/kg	26
Chrysene	~~ND~~ UJ	260	ug/kg	31
Dibenz(a,h)anthracene	ND	260	ug/kg	29
Fluoranthene	~~ND~~ UJ	260	ug/kg	28
Fluorene	ND	260	ug/kg	35
Indeno(1,2,3-cd)pyrene	ND	260	ug/kg	27
Naphthalene	ND	260	ug/kg	23
Phenanthrene	ND	260	ug/kg	42
Pyrene	~~ND~~ UJ	260	ug/kg	27
2-Methylnaphthalene	ND	260	ug/kg	24
1-Methylnaphthalene	ND	260	ug/kg	28
Acenaphthene	ND	260	ug/kg	25
Acenaphthylene	ND	260	ug/kg	30
Anthracene	ND	260	ug/kg	26
Benzo(a)anthracene	~~ND~~ UJ	260	ug/kg	33
Benzo(b)fluoranthene	ND	260	ug/kg	41

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	83	(42 - 110)
Terphenyl-d14	102	(37 - 137)
2-Fluorobiphenyl	90	(43 - 110)
2-Fluorophenol	78	(11 - 116)
Phenol-d5	84	(25 - 115)
2,4,6-Tribromophenol	104	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

hw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649A-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-017	Work Order #...:	L9QV21AA	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0326035
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326055	Analysis Time..:	20:06		
Dilution Factor:	2.4	Initial Wgt/Vol:	25 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	90	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**59 J**	**160**	**ug/kg**	**16**
Acenaphthylene	**40 J**	**160**	**ug/kg**	**19**
Anthracene	**560**	**160**	**ug/kg**	**16**
Benzo(a)anthracene	**2400 J**	**160**	**ug/kg**	**21**
Benzo(b)fluoranthene	**850**	**160**	**ug/kg**	**26**
Benzo(k)fluoranthene	**870**	**160**	**ug/kg**	**33**
Benzo(ghi)perylene	**220**	**160**	**ug/kg**	**16**
Benzo(a)pyrene	**1300**	**160**	**ug/kg**	**16**
Chrysene	**2400 J**	**160**	**ug/kg**	**20**
Dibenz(a,h)anthracene	ND	160	ug/kg	18
Fluoranthene	**12000 J**	**160**	**ug/kg**	**18**
Fluorene	ND	160	ug/kg	22
Indeno(1,2,3-cd)pyrene	**450**	**160**	**ug/kg**	**17**
Naphthalene	**370**	**160**	**ug/kg**	**14**
Phenanthrene	**660**	**160**	**ug/kg**	**26**
Pyrene	**8400 J**	**160**	**ug/kg**	**17**
2-Methylnaphthalene	ND	160	ug/kg	15
1-Methylnaphthalene	ND	160	ug/kg	18

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	58	(42 - 110)
Terphenyl-d14	69	(37 - 137)
2-Fluorobiphenyl	56	(43 - 110)
2-Fluorophenol	37	(11 - 116)
Phenol-d5	48	(25 - 115)
2,4,6-Tribromophenol	77	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649B-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-018	Work Order #...:	L9QV41AG	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0326035
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326055	Analysis Time..:	21:06		
Dilution Factor:	2.39	Initial Wgt/Vol:	25.1 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	89	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	660	140	ug/kg	29
Benzo(ghi)perylene	150	140	ug/kg	14
Benzo(a)pyrene	1100	140	ug/kg	14
Chrysene	2200 J	140	ug/kg	17
Dibenz(a,h)anthracene	ND	140	ug/kg	16
Fluoranthene	9800 J	140	ug/kg	15
Fluorene	ND	140	ug/kg	19
Indeno(1,2,3-cd)pyrene	ND	140	ug/kg	15
Naphthalene	290	140	ug/kg	12
Phenanthrene	450	140	ug/kg	22
Pyrene	5500 J	140	ug/kg	14
2-Methylnaphthalene	ND	140	ug/kg	13
1-Methylnaphthalene	ND	140	ug/kg	15
Acenaphthene	49 J	140	ug/kg	14
Acenaphthylene	28 J	140	ug/kg	16
Anthracene	400	140	ug/kg	14
Benzo(a)anthracene	1500 J	140	ug/kg	18
Benzo(b)fluoranthene	690	140	ug/kg	22

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	87	(42 - 110)
Terphenyl-d14	87	(37 - 137)
2-Fluorobiphenyl	79	(43 - 110)
2-Fluorophenol	52	(11 - 116)
Phenol-d5	77	(25 - 115)
2,4,6-Tribromophenol	99	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

lew
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649C-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-019	**Work Order #...:**	L9QV61AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326055	**Analysis Time..:**	21:27		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	90	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	**930**	**170**	**ug/kg**	**33**
Benzo(ghi)perylene	**220**	**170**	**ug/kg**	**16**
Benzo(a)pyrene	**1600**	**170**	**ug/kg**	**17**
Chrysene	**2400 J**	**170**	**ug/kg**	**20**
Dibenz(a,h)anthracene	ND	170	ug/kg	18
Fluoranthene	**15000 J**	**170**	**ug/kg**	**18**
Fluorene	ND	170	ug/kg	22
Indeno(1,2,3-cd)pyrene	**480**	**170**	**ug/kg**	**17**
Naphthalene	**280**	**170**	**ug/kg**	**14**
Phenanthrene	**1100**	**170**	**ug/kg**	**26**
Pyrene	**9900 J**	**170**	**ug/kg**	**17**
2-Methylnaphthalene	ND	170	ug/kg	15
1-Methylnaphthalene	ND	170	ug/kg	18
Acenaphthene	**94 J**	**170**	**ug/kg**	**16**
Acenaphthylene	**98 J**	**170**	**ug/kg**	**19**
Anthracene	**890**	**170**	**ug/kg**	**16**
Benzo(a)anthracene	**2600 J**	**170**	**ug/kg**	**21**
Benzo(b)fluoranthene	**980**	**170**	**ug/kg**	**26**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	85	(42 - 110)
Terphenyl-d14	94	(37 - 137)
2-Fluorobiphenyl	73	(43 - 110)
2-Fluorophenol	74	(11 - 116)
Phenol-d5	77	(25 - 115)
2,4,6-Tribromophenol	104	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

hw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649D-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-020	**Work Order #...:**	L9QV71AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326055	**Analysis Time..:**	21:47		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	91	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	**850**	**180**	**ug/kg**	**36**
Benzo(ghi)perylene	**280**	**180**	**ug/kg**	**18**
Benzo(a)pyrene	**1800**	**180**	**ug/kg**	**18**
Chrysene	**3900 J**	**180**	**ug/kg**	**21**
Dibenz(a,h)anthracene	ND	180	ug/kg	20
Fluoranthene	**16000 J**	**180**	**ug/kg**	**19**
Fluorene	ND	180	ug/kg	23
Indeno(1,2,3-cd)pyrene	ND	180	ug/kg	18
Naphthalene	**300**	**180**	**ug/kg**	**15**
Phenanthrene	**810**	**180**	**ug/kg**	**28**
Pyrene	**10000 J**	**180**	**ug/kg**	**18**
2-Methylnaphthalene	ND	180	ug/kg	16
1-Methylnaphthalene	ND	180	ug/kg	19
Acenaphthene	**66 J**	**180**	**ug/kg**	**17**
Acenaphthylene	**36 J**	**180**	**ug/kg**	**20**
Anthracene	**680**	**180**	**ug/kg**	**17**
Benzo(a)anthracene	**2800 J**	**180**	**ug/kg**	**22**
Benzo(b)fluoranthene	**1300**	**180**	**ug/kg**	**28**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	57	(42 - 110)
Terphenyl-d14	78	(37 - 137)
2-Fluorobiphenyl	51	(43 - 110)
2-Fluorophenol	50	(11 - 116)
Phenol-d5	55	(25 - 115)
2,4,6-Tribromophenol	72	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-649E-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-021	Work Order #...:	L9QV81AG	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0326035
Prep Date.....:	11/22/10	Analysis Date..:	11/30/10		
Prep Batch #...:	0326055	Analysis Time..:	22:07		
Dilution Factor:	2.38	Initial Wgt/Vol:	25.2 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	88	Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	1100	130	ug/kg	27
Benzo(ghi)perylene	410	130	ug/kg	13
Benzo(a)pyrene	2400	130	ug/kg	13
Chrysene	3900 J	130	ug/kg	16
Dibenz(a,h)anthracene	ND	130	ug/kg	15
Fluoranthene	20000 J	130	ug/kg	14
Fluorene	50 J	130	ug/kg	18
Indeno(1,2,3-cd)pyrene	580	130	ug/kg	14
Naphthalene	370	130	ug/kg	12
Phenanthrene	1200	130	ug/kg	21
Pyrene	270 J	130	ug/kg	14
2-Methylnaphthalene	ND	130	ug/kg	12
1-Methylnaphthalene	ND	130	ug/kg	14
Acenaphthene	110 J	130	ug/kg	13
Acenaphthylene	60 J	130	ug/kg	15
Anthracene	1100	130	ug/kg	13
Benzo(a)anthracene	4900 J	130	ug/kg	17
Benzo(b)fluoranthene	2000	130	ug/kg	21

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	89	(42 - 110)
Terphenyl-d14	109	(37 - 137)
2-Fluorobiphenyl	84	(43 - 110)
2-Fluorophenol	64	(11 - 116)
Phenol-d5	86	(25 - 115)
2,4,6-Tribromophenol	138 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650A-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-022	**Work Order #...:**	L9QV91AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326055	**Analysis Time..:**	22:27		
Dilution Factor:	2.37	**Initial Wgt/Vol:**	25.3 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	89	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	150	ug/kg	29
Benzo(ghi)perylene	ND	150	ug/kg	15
Benzo(a)pyrene	ND	150	ug/kg	15
Chrysene	~~ND~~ UJ	150	ug/kg	17
Dibenz(a,h)anthracene	ND	150	ug/kg	16
Fluoranthene	~~ND~~ UJ	150	ug/kg	16
Fluorene	ND	150	ug/kg	19
Indeno(1,2,3-cd)pyrene	ND	150	ug/kg	15
Naphthalene	ND	150	ug/kg	13
Phenanthrene	ND	150	ug/kg	23
Pyrene	~~ND~~ UJ	150	ug/kg	15
2-Methylnaphthalene	ND	150	ug/kg	13
1-Methylnaphthalene	ND	150	ug/kg	16
Acenaphthene	ND	150	ug/kg	14
Acenaphthylene	ND	150	ug/kg	17
Anthracene	ND	150	ug/kg	14
Benzo(a)anthracene	~~ND~~ UJ	150	ug/kg	18
Benzo(b)fluoranthene	ND	150	ug/kg	23

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	84	(42 - 110)
Terphenyl-d14	106	(37 - 137)
2-Fluorobiphenyl	77	(43 - 110)
2-Fluorophenol	60	(11 - 116)
Phenol-d5	82	(25 - 115)
2,4,6-Tribromophenol	104	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650B-C

GC/MS Semivolatiles

Lot-Sample #...: C0K090449-023
Date Sampled...: 11/04/10
Prep Date.....: 11/22/10
Prep Batch #...: 0326055
Dilution Factor: 6
% Moisture.....: 92

Work Order #...: L9QWA1AG
Date Received..: 11/09/10
Analysis Date..: 11/30/10
Analysis Time..: 22:47
Initial Wgt/Vol: 25 g
Analyst ID.....: 430261
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0326035
Final Wgt/Vol..: 0.5 mL
Instrument ID..: 732

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	500	ug/kg	100
Benzo(ghi)perylene	ND	500	ug/kg	49
Benzo(a)pyrene	ND	500	ug/kg	50
Chrysene	ND	500	ug/kg	59
Dibenz(a,h)anthracene	ND	500	ug/kg	55
Fluoranthene	ND	500	ug/kg	53
Fluorene	ND	500	ug/kg	65
Indeno(1,2,3-cd)pyrene	ND	500	ug/kg	51
Naphthalene	ND	500	ug/kg	43
Phenanthrene	ND	500	ug/kg	79
Pyrene	ND	500	ug/kg	50
2-Methylnaphthalene	ND	500	ug/kg	45
1-Methylnaphthalene	ND	500	ug/kg	53
Acenaphthene	ND	500	ug/kg	48
Acenaphthylene	ND	500	ug/kg	57
Anthracene	ND	500	ug/kg	49
Benzo(a)anthracene	ND	500	ug/kg	62
Benzo(b)fluoranthene	ND	500	ug/kg	78

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	75	(42 - 110)
Terphenyl-d14	76	(37 - 137)
2-Fluorobiphenyl	76	(43 - 110)
2-Fluorophenol	52	(11 - 116)
Phenol-d5	62	(25 - 115)
2,4,6-Tribromophenol	81	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

KW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650C-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-024	**Work Order #...:**	L9QWC1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326055	**Analysis Time..:**	23:07		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	90	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	160	ug/kg	32
Benzo(ghi)perylene	ND	160	ug/kg	16
Benzo(a)pyrene	ND	160	ug/kg	16
Chrysene	~~ND~~ UJ	160	ug/kg	19
Dibenz(a,h)anthracene	ND	160	ug/kg	17
Fluoranthene	~~ND~~ UJ	160	ug/kg	17
Fluorene	ND	160	ug/kg	21
Indeno(1,2,3-cd)pyrene	ND	160	ug/kg	16
Naphthalene	ND	160	ug/kg	13
Phenanthrene	ND	160	ug/kg	25
Pyrene	~~ND~~ UJ	160	ug/kg	16
2-Methylnaphthalene	ND	160	ug/kg	14
1-Methylnaphthalene	ND	160	ug/kg	17
Acenaphthene	ND	160	ug/kg	15
Acenaphthylene	ND	160	ug/kg	18
Anthracene	ND	160	ug/kg	15
Benzo(a)anthracene	~~ND~~ UJ	160	ug/kg	20
Benzo(b)fluoranthene	ND	160	ug/kg	25

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	63	(42 - 110)
Terphenyl-d14	87	(37 - 137)
2-Fluorobiphenyl	59	(43 - 110)
2-Fluorophenol	58	(11 - 116)
Phenol-d5	61	(25 - 115)
2,4,6-Tribromophenol	84	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650D-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-025	**Work Order #...:**	L9QWE1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	11/30/10		
Prep Batch #...:	0326055	**Analysis Time..:**	23:27		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	90	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	160	ug/kg	33
Benzo(ghi)perylene	ND	160	ug/kg	16
Benzo(a)pyrene	ND	160	ug/kg	16
Chrysene	ND	160	ug/kg	19
Dibenz(a,h)anthracene	ND	160	ug/kg	18
Fluoranthene	ND	160	ug/kg	17
Fluorene	ND	160	ug/kg	21
Indeno(1,2,3-cd)pyrene	ND	160	ug/kg	17
Naphthalene	ND	160	ug/kg	14
Phenanthrene	ND	160	ug/kg	26
Pyrene	ND	160	ug/kg	16
2-Methylnaphthalene	ND	160	ug/kg	15
1-Methylnaphthalene	ND	160	ug/kg	17
Acenaphthene	ND	160	ug/kg	16
Acenaphthylene	ND	160	ug/kg	19
Anthracene	ND	160	ug/kg	16
Benzo(a)anthracene	ND	160	ug/kg	20
Benzo(b)fluoranthene	ND	160	ug/kg	25

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(42 - 110)
Terphenyl-d14	74	(37 - 137)
2-Fluorobiphenyl	59	(43 - 110)
2-Fluorophenol	60	(11 - 116)
Phenol-d5	59	(25 - 115)
2,4,6-Tribromophenol	73	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

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12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-650E-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-026	**Work Order #...:**	L9QWF1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	20:00		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	91	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	180	ug/kg	36
Benzo(ghi)perylene	ND	180	ug/kg	18
Benzo(a)pyrene	ND	180	ug/kg	18
Chrysene	~~ND~~ UJ	180	ug/kg	21
Dibenz(a,h)anthracene	ND	180	ug/kg	20
Fluoranthene	~~ND~~ UJ	180	ug/kg	19
Fluorene	ND	180	ug/kg	24
Indeno(1,2,3-cd)pyrene	ND	180	ug/kg	18
Naphthalene	~~ND~~ UJ	180	ug/kg	15
Phenanthrene	~~ND~~ UJ	180	ug/kg	29
Pyrene	~~ND~~ UJ	180	ug/kg	18
2-Methylnaphthalene	~~ND~~ ↓	180	ug/kg	16
1-Methylnaphthalene	~~ND~~ ↓	180	ug/kg	19
Acenaphthene	ND	180	ug/kg	17
Acenaphthylene	ND	180	ug/kg	21
Anthracene	~~ND~~ UJ	180	ug/kg	18
Benzo(a)anthracene	~~ND~~ UJ	180	ug/kg	22
Benzo(b)fluoranthene	ND	180	ug/kg	28

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	108	(42 - 110)
Terphenyl-d14	124	(37 - 137)
2-Fluorobiphenyl	98	(43 - 110)
2-Fluorophenol	79	(11 - 116)
Phenol-d5	109	(25 - 115)
2,4,6-Tribromophenol	134 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683A-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-027	**Work Order #...:**	L9QWG1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	20:19		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	89	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	150	ug/kg	30
Benzo(ghi)perylene	ND	150	ug/kg	15
Benzo(a)pyrene	ND	150	ug/kg	15
Chrysene	~~ND~~ UJ	150	ug/kg	17
Dibenz(a,h)anthracene	ND	150	ug/kg	16
Fluoranthene	~~ND~~ UJ	150	ug/kg	16
Fluorene	ND	150	ug/kg	19
Indeno(1,2,3-cd)pyrene	ND	150	ug/kg	15
Naphthalene	~~ND~~ UJ	150	ug/kg	13
Phenanthrene	~~ND~~	150	ug/kg	23
Pyrene	~~ND~~	150	ug/kg	15
2-Methylnaphthalene	~~ND~~	150	ug/kg	13
1-Methylnaphthalene	~~ND~~	150	ug/kg	16
Acenaphthene	ND	150	ug/kg	14
Acenaphthylene	ND	150	ug/kg	17
Anthracene	~~ND~~ UJ	150	ug/kg	14
Benzo(a)anthracene	~~ND~~ UJ	150	ug/kg	18
Benzo(b)fluoranthene	ND	150	ug/kg	23

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	83	(42 - 110)
Terphenyl-d14	86	(37 - 137)
2-Fluorobiphenyl	56	(43 - 110)
2-Fluorophenol	77	(11 - 116)
Phenol-d5	78	(25 - 115)
2,4,6-Tribromophenol	98	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683B-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-028	**Work Order #...:**	L9QWH1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	16:16		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	89	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	150	ug/kg	30
Benzo(ghi)perylene	ND	150	ug/kg	15
Benzo(a)pyrene	ND	150	ug/kg	15
Chrysene	~~ND~~ UJ	150	ug/kg	17
Dibenz(a,h)anthracene	ND	150	ug/kg	16
Fluoranthene	~~ND~~ UJ	150	ug/kg	16
Fluorene	ND	150	ug/kg	19
Indeno(1,2,3-cd)pyrene	ND	150	ug/kg	15
Naphthalene	~~ND~~ UJ	150	ug/kg	13
Phenanthrene	~~ND~~	150	ug/kg	23
Pyrene	~~ND~~	150	ug/kg	15
2-Methylnaphthalene	~~ND~~	150	ug/kg	13
1-Methylnaphthalene	~~ND~~	150	ug/kg	16
Acenaphthene	ND	150	ug/kg	14
Acenaphthylene	ND	150	ug/kg	17
Anthracene	~~ND~~ UJ	150	ug/kg	14
Benzo(a)anthracene	~~ND~~ UJ	150	ug/kg	18
Benzo(b)fluoranthene	ND	150	ug/kg	23

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	89	(42 - 110)
Terphenyl-d14	140 *	(37 - 137)
2-Fluorobiphenyl	76	(43 - 110)
2-Fluorophenol	61	(11 - 116)
Phenol-d5	91	(25 - 115)
2,4,6-Tribromophenol	121 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

NW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: AT0-683C-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-029	**Work Order #...:**	L9QWJ1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	16:35		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	93	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	220	ug/kg	44
Benzo(ghi)perylene	ND	220	ug/kg	21
Benzo(a)pyrene	ND	220	ug/kg	22
Chrysene	~~ND~~ UJ	220	ug/kg	26
Dibenz(a,h)anthracene	ND	220	ug/kg	24
Fluoranthene	~~ND~~ UJ	220	ug/kg	23
Fluorene	ND	220	ug/kg	28
Indeno(1,2,3-cd)pyrene	ND	220	ug/kg	22
Naphthalene	~~ND~~ UJ	220	ug/kg	19
Phenanthrene	~~ND~~	220	ug/kg	34
Pyrene	~~ND~~	220	ug/kg	22
2-Methylnaphthalene	~~ND~~	220	ug/kg	19
1-Methylnaphthalene	~~ND~~	220	ug/kg	23
Acenaphthene	~~ND~~	220	ug/kg	21
Acenaphthylene	~~ND~~	220	ug/kg	25
Anthracene	~~ND~~ UJ	220	ug/kg	21
Benzo(a)anthracene	~~ND~~ UJ	220	ug/kg	27
Benzo(b)fluoranthene	ND	220	ug/kg	34

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	99	(42 - 110)
Terphenyl-d14	113	(37 - 137)
2-Fluorobiphenyl	95	(43 - 110)
2-Fluorophenol	81	(11 - 116)
Phenol-d5	95	(25 - 115)
2,4,6-Tribromophenol	126 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

Results and reporting limits have been adjusted for dry weight.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTA-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-030	**Work Order #...:**	L9QWK1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	16:54		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	88	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	320	ug/kg	65
Benzo(ghi)perylene	ND	320	ug/kg	32
Benzo(a)pyrene	ND	320	ug/kg	32
Chrysene	~~ND~~ UJ	320	ug/kg	38
Dibenz(a,h)anthracene	ND	320	ug/kg	36
Fluoranthene	~~ND~~ UJ	320	ug/kg	35
Fluorene	ND	320	ug/kg	43
Indeno(1,2,3-cd)pyrene	ND	320	ug/kg	33
Naphthalene	~~ND~~ UJ	320	ug/kg	28
Phenanthrene	~~ND~~	320	ug/kg	51
Pyrene	~~ND~~	320	ug/kg	33
2-Methylnaphthalene	~~ND~~	320	ug/kg	29
1-Methylnaphthalene	~~ND~~	320	ug/kg	34
Acenaphthene	ND	320	ug/kg	31
Acenaphthylene	ND	320	ug/kg	37
Anthracene	~~ND~~ UJ	320	ug/kg	32
Benzo(a)anthracene	~~ND~~ UJ	320	ug/kg	40
Benzo(b)fluoranthene	ND	320	ug/kg	51

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	78	(42 - 110)
Terphenyl-d14	86	(37 - 137)
2-Fluorobiphenyl	89	(43 - 110)
2-Fluorophenol	61	(11 - 116)
Phenol-d5	79	(25 - 115)
2,4,6-Tribromophenol	95	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTB-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-031	**Work Order #...:**	L9QWL1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	17:13		
Dilution Factor:	5.95	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	88	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	340	ug/kg	68
Benzo(ghi)perylene	ND	340	ug/kg	33
Benzo(a)pyrene	ND	340	ug/kg	34
Chrysene	~~ND~~ UJ	340	ug/kg	40
Dibenz(a,h)anthracene	ND	340	ug/kg	37
Fluoranthene	~~ND~~ UJ	340	ug/kg	36
Fluorene	ND	340	ug/kg	44
Indeno(1,2,3-cd)pyrene	ND	340	ug/kg	35
Naphthalene	~~ND~~ UJ	340	ug/kg	29
Phenanthrene	~~ND~~	340	ug/kg	53
Pyrene	~~ND~~	340	ug/kg	34
2-Methylnaphthalene	~~ND~~	340	ug/kg	30
1-Methylnaphthalene	~~ND~~	340	ug/kg	36
Acenaphthene	~~ND~~	340	ug/kg	32
Acenaphthylene	~~ND~~	340	ug/kg	38
Anthracene	~~ND~~	340	ug/kg	33
Benzo(a)anthracene	~~ND~~	340	ug/kg	42
Benzo(b)fluoranthene	ND	340	ug/kg	53

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	89	(42 - 110)
Terphenyl-d14	84	(37 - 137)
2-Fluorobiphenyl	92	(43 - 110)
2-Fluorophenol	66	(11 - 116)
Phenol-d5	85	(25 - 115)
2,4,6-Tribromophenol	93	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

lw
12/17/10

EA Engineering, Science and Technology

Client Sample ID: PRETESTC-C

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-032	**Work Order #...:**	L9QWP1AG	**Matrix.....:**	BIOLOGIC
Date Sampled...:	11/04/10	**Date Received..:**	11/09/10	**MS Run #.....:**	0326035
Prep Date.....:	11/22/10	**Analysis Date..:**	12/01/10		
Prep Batch #...:	0326055	**Analysis Time..:**	17:33		
Dilution Factor:	6	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	86	**Analyst ID.....:**	430261	**Instrument ID..:**	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(k)fluoranthene	ND	290	ug/kg	59
Benzo(ghi)perylene	ND	290	ug/kg	29
Benzo(a)pyrene	ND	290	ug/kg	29
Chrysene	~~ND~~ UJ	290	ug/kg	35
Dibenz(a,h)anthracene	ND	290	ug/kg	33
Fluoranthene	~~ND~~ UJ	290	ug/kg	31
Fluorene	ND	290	ug/kg	39
Indeno(1,2,3-cd)pyrene	ND	290	ug/kg	30
Naphthalene	~~ND~~ UJ	290	ug/kg	25
Phenanthrene	~~ND~~	290	ug/kg	46
Pyrene	~~ND~~	290	ug/kg	30
2-Methylnaphthalene	~~ND~~	290	ug/kg	26
1-Methylnaphthalene	~~ND~~	290	ug/kg	31
Acenaphthene	ND	290	ug/kg	28
Acenaphthylene	ND	290	ug/kg	33
Anthracene	~~ND~~ UJ	290	ug/kg	29
Benzo(a)anthracene	~~ND~~ UJ	290	ug/kg	37
Benzo(b)fluoranthene	ND	290	ug/kg	46

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	71	(42 - 110)
Terphenyl-d14	84	(37 - 137)
2-Fluorobiphenyl	82	(43 - 110)
2-Fluorophenol	69	(11 - 116)
Phenol-d5	80	(25 - 115)
2,4,6-Tribromophenol	85	(35 - 116)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

MW
12/17/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-033	Work Order #...:	L9RJP1AA	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0326035
Prep Date.....:	11/22/10	Analysis Date..:	12/01/10		
Prep Batch #...:	0326055	Analysis Time..:	17:52		
Dilution Factor:	2	Initial Wgt/Vol:	5 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:		Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	280	13	ug/kg	1.3
Acenaphthylene	1100	13	ug/kg	1.5
Anthracene	1100 J	13	ug/kg	1.3
Benzo(a)anthracene	4100 J	13	ug/kg	1.7
Benzo(b)fluoranthene	3000	13	ug/kg	2.1
Benzo(k)fluoranthene	2900	13	ug/kg	2.7
Benzo(ghi)perylene	3300	13	ug/kg	1.3
Benzo(a)pyrene	3100	13	ug/kg	1.3
Chrysene	5400 J	13	ug/kg	1.6
Dibenz(a,h)anthracene	1100	13	ug/kg	1.5
Fluoranthene	7400 J	13	ug/kg	1.4
Fluorene	350 J	13	ug/kg	1.8
Indeno(1,2,3-cd)pyrene	2700	13	ug/kg	1.4
Naphthalene	670	13	ug/kg	1.2
Phenanthrene	4300 J	13	ug/kg	2.1
Pyrene	7900 J	13	ug/kg	1.3
2-Methylnaphthalene	420	13	ug/kg	1.2
1-Methylnaphthalene	340 J	13	ug/kg	1.4

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	88	(42 - 110)
Terphenyl-d14	109	(37 - 137)
2-Fluorobiphenyl	113 *	(43 - 110)
2-Fluorophenol	91	(11 - 116)
Phenol-d5	100	(25 - 115)
2,4,6-Tribromophenol	113	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

lew
12/24/10

EA Engineering, Science and Technology

Client Sample ID: SRM(metals 1566b, PAHs,PCBs 1944)

GC/MS Semivolatiles

Lot-Sample #...:	C0K090449-034	Work Order #...:	L9RJQ1AA	Matrix.....:	BIOLOGIC
Date Sampled...:	11/04/10	Date Received..:	11/09/10	MS Run #.....:	0326035
Prep Date.....:	11/22/10	Analysis Date..:	12/01/10		
Prep Batch #...:	0326055	Analysis Time..:	18:11		
Dilution Factor:	12	Initial Wgt/Vol:	5 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:		Analyst ID.....:	430261	Instrument ID..:	732
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	240	80	ug/kg	7.7
Acenaphthylene	820	80	ug/kg	9.2
Anthracene	1000	80	ug/kg	7.8
Benzo(a)anthracene	4600 J	80	ug/kg	10
Benzo(b)fluoranthene	3400	80	ug/kg	13
Benzo(k)fluoranthene	2500	80	ug/kg	16
Benzo(ghi)perylene	3600 J	80	ug/kg	8.0
Benzo(a)pyrene	3200 J	80	ug/kg	8.0
Chrysene	5000 J	80	ug/kg	9.5
Dibenz(a,h)anthracene	1200 J	80	ug/kg	8.9
Fluoranthene	6700 J	80	ug/kg	8.6
Fluorene	260	80	ug/kg	11
Indeno(1,2,3-cd)pyrene	2800 J	80	ug/kg	8.2
Naphthalene	620	80	ug/kg	6.9
Phenanthrene	4200	80	ug/kg	13
Pyrene	8300 J	80	ug/kg	8.1
2-Methylnaphthalene	400	80	ug/kg	7.2
1-Methylnaphthalene	310	80	ug/kg	8.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	41 *	(42 - 110)
Terphenyl-d14	55	(37 - 137)
2-Fluorobiphenyl	53	(43 - 110)
2-Fluorophenol	41	(11 - 116)
Phenol-d5	47	(25 - 115)
2,4,6-Tribromophenol	54	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

MW
12/17/10

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0J060555

Karin Olsen

EA Engineering, Science and Te
15 Loveton Circle
Sparks, MD 21152

TESTAMERICA LABORATORIES, INC.

Carrie L. Gamber
Project Manager

November 30, 2010

301 Alpha Drive Pittsburgh, PA 15238 **tel** 412.963.7058 **fax** 412.963.2468 www.testamericainc.com

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW --	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J060555

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on October 6, and 19, 2010. The coolers were received within the proper temperature range.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Due to the concentration of target compounds detected and/or matrix several samples were analyzed at a dilution.

Several samples had surrogates and/or internal stadarnd area counts not meet criteria. There were insufficiet sample volume for re-extraction. All data was reported "as is".

The SRM did not have any target compounds detected above the reporting limits due to the concentration of the SRM being to low for the instrument to detect.

The matrix spike of sample PR-MOAM-WB-E recovered outside of the control limits for pyrene.

The relative percent difference between the matrix spike and the matrix spike duplicate of sample PR-MOAM-WB-E was outside of the control limits for several compounds.

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

Several continuing calibration standards had compounds with a %D >25%; but were within the expected performance range for these compounds.

PCB Congeners:
The matrix spike and matrix spike duplicate recovered outside of the control limits for PCB 101.

Metals:
The serial dilutions of samples PR-MOAM-WB-E and PR-MOAM-FT-E were outside of the percent difference control limits for zinc. The results were flagged with an "E" qualifier.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J060555

Metals (cont):
The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

General Chemistry:
There were no problems associated with the analysis.

Brooks Rand LLC performed the arsenic speciation analysis. Their report will follow under separate cover.

METHODS SUMMARY

C0J060555

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
Percent Lipids	SW846 Total Res	
Percent Moisture	SM20 2540G	
PCB Congeners by SW-846 8082	SW846 8082 Cong	
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	

References:

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0J060555

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L73T2	001	PR-MOAM-WB-A	10/01/10	15:10
L73VE	002	PR-MOAM-WB-B	10/01/10	15:11
L73VG	003	PR-MOAM-WB-C	10/01/10	15:13
L73VH	004	PR-MOAM-WB-D	10/01/10	15:15
L73VJ	005	PR-MOAM-WB-E	10/01/10	15:16
L73VM	006	PR-MOAM-FT-A	10/01/10	15:18
L73VP	007	PR-MOAM-FT-B	10/01/10	15:24
L73VQ	008	PR-MOAM-FT-C	10/01/10	15:22
L73VR	009	PR-MOAM-FT-D	10/01/10	15:26
L73VT	010	PR-MOAM-FT-E	10/01/10	15:27
L73VV	011	CP-MOAM-WB-A	10/01/10	14:30
L73VX	012	CP-MOAM-WB-B	10/01/10	14:40
L73V0	013	CP-MOAM-WB-C	10/01/10	14:42
L73V2	014	CP-MOAM-WB-D	10/01/10	14:44
L73V3	015	CP-MOAM-WB-E	10/01/10	14:46
L73V4	016	CP-MOAM-FT-A	10/01/10	14:47
L73V5	017	CP-MOAM-FT-B	10/01/10	14:48
L73V6	018	CP-MOAM-FT-C	10/01/10	14:50
L73V7	019	CP-MOAM-FT-D	10/01/10	14:52
L73V8	020	CP-MOAM-FT-E	10/01/10	14:54
L733E	021	SRM 1	10/01/10	

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

C0J060555

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Tissue Sampling

Project#: 1453417 0008

Page 2 of 4

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN:

Date	Time	Water	Tissue	Sample Identification		No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)	Remarks
10.1.10	1430		X	CP-MOAM-WB-A	WHOLE BODY	1	x	x	x	x	x	SEE PROJECT SPECIFIC
	1440		X	CP-MOAM-WB-B		1	x	x	x	x	x	ANALYTE LIST
	1442		X	CP-MOAM-WB-C		1	x	x	x		x	Per our discussions:
	1444		X	CP-MOAM-WB-D		1	x	x	x		x	Collect Filet per SOP
	1446		X	CP-MOAM-WB-E		1	x	x	x		x	EA SOP (skin + meat, no
	1447		X	CP-MOAM-FT-A	FILET	1	x	x	x	x	x	scales) from left side of
	1448		X	CP-MOAM-FT-B		1	x	x	x	x	x	fish. Archive filet
	1450		X	CP-MOAM-FT-C		1	x	x	x		x	from right side of
	1452		X	CP-MOAM-FT-D		1	x	x	x		x	fish & hold pending
	1454		X	CP-MOAM-FT-E		1	x	x	x		x	direction from
												MES/EA.

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Hilary Hakwood	10/1/2010 1545		
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**
		P Barrat	10/6/10 1000

Coke Point
Tissue Composite Samples

WB = Whole Body
FT = Filet

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(1 - 165)

C0J060555

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Tissue Sampling

Project#: 1453417 0008

Page 4 of 4

Parameters/Method Numbers for Analysis

Date	Time	Water	Tissue	Sample Identification	No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
10-1-10	1510		X	PR-MOAM-WB-A	1	x	x	x	x	x
	1511		X	PR-MOAM-WB-B	1	x	x	x	x	x
	1513		X	PR-MOAM-WB-C	1	x	x	x		x
	1515		X	PR-MOAM-WB-D	1	x	x	x		x
	1516		X	PR-MOAM-WB-E /MS/MSD	1	x	x	x		x
	~~1516~~		~~X~~	~~PR-MOAM-WB-EMS~~	~~1~~	~~x~~	~~x~~	~~x~~	~~x~~	
	~~1516~~		~~X~~	~~PR-MOAM-WB-EMSD~~	~~1~~	~~x~~	~~x~~	~~x~~	~~x~~	
10-1-10	1518		X	PR-MOAM-FT-A	1	x	x	x	x	x
	1519		X	PR-MOAM-FT-B	1	x	x	x	x	x
	1522		X	PR-MOAM-FT-C	1	x	x	x		x
	1526		X	PR-MOAM-FT-D	1	x	x	x		x
	1527		X	PR-MOAM-FT-E	1	x	x	x		x
	1550		X	PR-MOAM-FT-EMS	1	x	x	x	x	
	1550		X	PR-MOAM-FT-EMSD	1	x	x	x	x	

Filet

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN:

Remarks

SEE PROJECT SPECIFIC ANALYTE LIST

→ Please use mass from this composite for MS/MSD

SEE NOTE BELOW

Extra fish provided for Filet MS/MSD

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
Hilary Lockwood	10/1/2010 1545		
Relinquished by: (Signature)	**Date/Time**	**Received by Laboratory: (Signature)**	**Date/Time**
		P Frank	10/6/10 1000

Coke Point Tissue Composite Samples

WB = Whole body
FT = Filet

NOTE: PER OUR DISCUSSION, collect filet per EA SOP. Include skin & meat, no scales. Collect filet from left side & analyze; collect filet from right side & archive pending direction from MESIEA.

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(1 - 165)

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060555

Client: Maryland Environmental Service, Millersville, MD Date: December 8, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-MOAM-WB-A	C0J06055-001	Tissue
2	PR-MOAM-WB-B	C0J06055-002	Tissue
3	PR-MOAM-WB-C	C0J06055-003	Tissue
4	PR-MOAM-WB-D	C0J06055-004	Tissue
5	PR-MOAM-WB-E	C0J06055-005	Tissue
5MS	PR-MOAM-WB-EMS	C0J06055-005MS	Tissue
5MSD	PR-MOAM-WB-EMSD	C0J06055-005MSD	Tissue
6	PR-MOAM-FT-A	C0J06055-006	Tissue
7	PR-MOAM-FT-B	C0J06055-007	Tissue
8	PR-MOAM-FT-C	C0J06055-008	Tissue
9	PR-MOAM-FT-D	C0J06055-009	Tissue
10	PR-MOAM-FT-E	C0J06055-010	Tissue
10MS	PR-MOAM-FT-EMS	C0J06055-010MS	Tissue
10MSD	PR-MOAM-FT-EMSD	C0J06055-010MSD	Tissue
11	CP-MOAM-WB-A	C0J06055-011	Tissue
12	CP-MOAM-WB-B	C0J06055-012	Tissue
13	CP-MOAM-WB-C	C0J06055-013	Tissue
14	CP-MOAM-WB-D	C0J06055-014	Tissue
15	CP-MOAM-WB-E	C0J06055-015	Tissue
16	CP-MOAM-FT-A	C0J06055-016	Tissue
17	CP-MOAM-FT-B	C0J06055-017	Tissue
18	CP-MOAM-FT-C	C0J06055-018	Tissue
19	CP-MOAM-FT-D	C0J06055-019	Tissue
20	CP-MOAM-FT-E	C0J06055-020	Tissue
21	SRM 1	C0J06055-021	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Blank ID	Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
Batch 0296044	Chromium	0.049	0.245	B	8
	Iron	1.0	5.0	B	7-9
	Manganese	0.017	0.085	None	All > 5X
	Selenium	0.10	0.50	None	All > 5X
Batch 0296045	Chromium	0.026	0.13	B	14, 16, 18
	Copper	0.015	0.075	None	All > 5X
	Selenium	0.10	0.50	None	All > 5X
	Zinc	0.076	0.38	None	All > 5X

Field and Equipment Blank - Field QC samples were not included in this data package.

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD samples exhibited acceptable %R and RPD values.

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - The ICP serial dilution sample exhibited acceptable %D values except the following.

ICP Sample ID	Compound	%D	Qualifier	Affected Samples
10	Zinc	43.6%	J	10-21

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified. The laboratory used (J) flags to indicate blank contamination which the reviewer deleted since the results were not affected.

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-A

TOTAL Metals

Lot-Sample #...: C0J060555-001 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**9.9**	**2.4**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AD**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.19	
Antimony	**0.069** ~~B~~ J	**0.16**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AE**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0027	
Arsenic	**0.51**	**0.081**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AF**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.013	
Beryllium	ND	0.081	mg/kg	SW846 6020	10/23-10/29/10	L73T21AG
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0030	
Cadmium	ND	0.081	mg/kg	SW846 6020	10/23-10/29/10	L73T21AH
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0074	
Chromium	**0.38** ~~J~~	**0.16**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AJ**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0065	
Cobalt	**0.070**	**0.040**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AK**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Copper	**12.5**	**0.16**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AL**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0069	
Iron	**25.3** ~~J~~	**4.0**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AM**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.23	

(Continued on next page)

lw 12/8/10

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-A

TOTAL Metals

Lot-Sample #...: C0J060555-001 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.12**	**0.081**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AN**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0028	
Manganese	**8.4 ~~J~~**	**0.040**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AP**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.012	
Nickel	**0.079 ~~B~~ J**	**0.081**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AQ**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0055	
Selenium	**1.2 ~~J~~**	**0.40**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AR**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.033	
Silver	**0.080 ~~B~~ J**	**0.081**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AT**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0019	
Thallium	ND	0.081	mg/kg	SW846 6020	10/23-10/29/10	L73T21AU
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0016	
Tin	**0.27 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AV**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.086	
Zinc	**23.7**	**0.40**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73T21AW**
		Dilution Factor: 0.81		Analysis Time..: 21:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0095	

Prep Batch #...: 0301021

Mercury	**0.027 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73T21A1**
		Dilution Factor: 1		Analysis Time..: 10:24	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-B

TOTAL Metals

Lot-Sample #...: C0J060555-002 Matrix.....: BIOLOGIC
Date Sampled...: 10/01/10 Date Received..: 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**56.3**	**3.0**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AK**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.24	
Antimony	**0.035 ~~B~~ J**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AL**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0033	
Arsenic	**0.73**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AM**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.016	
Beryllium	ND	0.10	mg/kg	SW846 6020	10/23-10/29/10	L73VE1AN
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0037	
Cadmium	ND	0.10	mg/kg	SW846 6020	10/23-10/29/10	L73VE1AP
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0091	
Chromium	**0.59 ~~J~~**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AQ**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0080	
Cobalt	**0.099**	**0.050**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AR**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0025	
Copper	**16.2**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AT**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0085	
Iron	**96.1 ~~J~~**	**5.0**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AU**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.29	

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-B

TOTAL Metals

Lot-Sample #...: C0J060555-002 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.36**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AV**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0034	
Manganese	**14.7 ~~J~~**	**0.050**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AW**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.014	
Nickel	**0.18**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1AX**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0068	
Selenium	**1.2 ~~J~~**	**0.50**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1A0**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.041	
Silver	**0.10**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1A1**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0024	
Thallium	ND	0.10	mg/kg	SW846 6020	10/23-10/29/10	L73VE1A2
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Tin	**0.29 ~~B~~ J**	**0.50**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1A3**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.11	
Zinc	**24.3**	**0.50**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VE1A4**
		Dilution Factor: 1		Analysis Time..: 21:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.012	

Prep Batch #...: 0301021

Mercury	**0.020 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VE1AC**
		Dilution Factor: 1		Analysis Time..: 10:26	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-C

TOTAL Metals

Lot-Sample #...: C0J060555-003 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**83.6**	**2.7**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AK**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.21	
Antimony	**0.022 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AL**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0030	
Arsenic	**0.81**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AM**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VG1AN
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0034	
Cadmium	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VG1AP
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0083	
Chromium	**0.67 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AQ**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0073	
Cobalt	**0.11**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AR**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0023	
Copper	**16.8**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AT**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0077	
Iron	**126 ~~J~~**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AU**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.26	

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Client Sample ID: PR-MOAM-WB-C

TOTAL Metals

Lot-Sample #...: C0J06C555-003 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.41**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AV**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0031	
Manganese	**23.8 ~~B~~**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AW**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.013	
Nickel	**0.20**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1AX**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0062	
Selenium	**1.2 ~~B~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1A0**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.037	
Silver	**0.11**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1A1**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0022	
Thallium	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VG1A2
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0018	
Tin	**0.26 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1A3**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.096	
Zinc	**23.6**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VG1A4**
		Dilution Factor: 0.91		Analysis Time..: 22:03	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.011	

Prep Batch #...: 0301021

Mercury	**0.021 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VG1AC**
		Dilution Factor: 1		Analysis Time..: 10:27	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-D

TOTAL Metals

Lot-Sample #...: C0J060555-004 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**35.4**	**2.6**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AK**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.20	
Antimony	**0.013 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AL**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0028	
Arsenic	**0.76**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AM**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	10/23-10/29/10	L73VH1AN
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0031	
Cadmium	ND	0.085	mg/kg	SW846 6020	10/23-10/29/10	L73VH1AP
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0077	
Chromium	**0.31 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AQ**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0068	
Cobalt	**0.082**	**0.042**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AR**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0021	
Copper	**20.2**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AT**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0072	
Iron	**54.4 ~~J~~**	**4.2**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AU**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.25	

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Client Sample ID: PR-MOAM-WB-D

TOTAL Metals

Lot-Sample #...: C0J060555-004 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.26**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AV**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0029	
Manganese	**15.2 ~~J~~**	**0.042**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AW**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.012	
Nickel	**0.10**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1AX**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0058	
Selenium	**1.3 ~~J~~**	**0.42**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1A0**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.035	
Silver	**0.15**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1A1**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Thallium	ND	0.085	mg/kg	SW846 6020	10/23-10/29/10	L73VH1A2
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0017	
Tin	**0.17 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1A3**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.090	
Zinc	**22.6**	**0.42**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VH1A4**
		Dilution Factor: 0.85		Analysis Time..: 22:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0099	

Prep Batch #...: 0301021

Mercury	**0.030 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VH1AC**
		Dilution Factor: 1		Analysis Time..: 10:29	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-E

TOTAL Metals

Lot-Sample #...: C0J060555-005 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**4.5**	**2.9**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AK**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.23	
Antimony	**0.012 ~~B~~ J**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AL**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0032	
Arsenic	**0.63**	**0.098**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AM**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.016	
Beryllium	ND	0.098	mg/kg	SW846 6020	10/23-10/29/10	L73VJ1AN
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0036	
Cadmium	ND	0.098	mg/kg	SW846 6020	10/23-10/29/10	L73VJ1AP
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0089	
Chromium	**0.68 ~~J~~**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AQ**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0078	
Cobalt	**0.037 ~~B~~ J**	**0.049**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AR**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0024	
Copper	**25.7**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AT**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0083	
Iron	**20.5 ~~J~~**	**4.9**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AU**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.28	

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Client Sample ID: PR-MOAM-WB-E

TOTAL Metals

Lot-Sample #...: C0J060555-005 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.10**	**0.098**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AV**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0033	
Manganese	**3.8 ~~J~~**	**0.049**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AW**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.014	
Nickel	**0.24**	**0.098**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1AX**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0067	
Selenium	**1.4 ~~J~~**	**0.49**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1A0**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.040	
Silver	**0.24**	**0.098**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1A1**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0024	
Thallium	ND	0.098	mg/kg	SW846 6020	10/23-10/29/10	L73VJ1A2
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Tin	**0.18 ~~B~~ J**	**0.49**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1A3**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.10	
Zinc	**22.0 ~~E~~ J**	**0.49**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VJ1A4**
		Dilution Factor: 0.98		Analysis Time..: 22:11	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.011	

Prep Batch #...: 0301021

Mercury	**0.045**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VJ1AC**
		Dilution Factor: 1		Analysis Time..: 10:31	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

E Matrix interference.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-A

TOTAL Metals

Lot-Sample #...: C0J060555-006 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**0.91 ~~B~~ J**	**2.1**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AK**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.16	
Antimony	**0.014 ~~B~~ J**	**0.14**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AL**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0023	
Arsenic	**0.36**	**0.069**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AM**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.011	
Beryllium	ND	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AN
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0026	
Cadmium	ND	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AP
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0063	
Chromium	ND	0.14	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AQ
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0055	
Cobalt	**0.021 ~~B~~ J**	**0.034**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AR**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0017	
Copper	**0.69**	**0.14**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AT**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0059	
Iron	**8.6 J**	**3.4**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VM1AU**
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.20	

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Client Sample ID: PR-MOAM-FT-A

TOTAL Metals

Lot-Sample #...: C0J060555-006 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.050 ~~B~~ J	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AV
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0023	
Manganese	0.28 ~~J~~	0.034	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AW
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.010	
Nickel	0.029 ~~B~~ J	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1AX
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0047	
Selenium	1.0 ~~J~~	0.34	mg/kg	SW846 6020	10/23-10/29/10	L73VM1A0
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.028	
Silver	0.0031 ~~B~~ J	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1A1
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0017	
Thallium	0.0063 ~~B~~ J	0.069	mg/kg	SW846 6020	10/23-10/29/10	L73VM1A2
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0014	
Tin	0.12 ~~B~~ J	0.34	mg/kg	SW846 6020	10/23-10/29/10	L73VM1A3
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.073	
Zinc	13.8	0.34	mg/kg	SW846 6020	10/23-10/29/10	L73VM1A4
		Dilution Factor: 0.69		Analysis Time..: 22:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0081	

Prep Batch #...: 0301021

Mercury	0.046	0.033	mg/kg	SW846 7471A	10/28/10	L73VM1AC
		Dilution Factor: 1		Analysis Time..: 10:39	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-B

TOTAL Metals

Lot-Sample #...: C0J060555-007 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**0.56 ~~B~~ J**	**2.7**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AK**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.21	
Antimony	**0.015 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AL**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0030	
Arsenic	**0.46**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AM**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VP1AN
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0034	
Cadmium	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VP1AP
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0083	
Chromium	ND	0.18	mg/kg	SW846 6020	10/23-10/29/10	L73VP1AQ
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0073	
Cobalt	**0.023 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AR**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0023	
Copper	**0.52**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AT**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0077	
Iron	**3.7 ~~B,J~~ B**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AU**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.26	

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Client Sample ID: PR-MOAM-FT-B

TOTAL Metals

Lot-Sample #...: C0J060555-007 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.056 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AV**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0031	
Manganese	**1.6 ~~J~~**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AW**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.013	
Nickel	**0.041 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1AX**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0062	
Selenium	**0.98 ~~J~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1A0**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.037	
Silver	ND	0.091	mg/kg	SW846 6020	10/23-10/29/10	L73VP1A1
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0022	
Thallium	**0.0032 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1A2**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	10/23-10/29/10	L73VP1A3
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.096	
Zinc	**11.2**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VP1A4**
		Dilution Factor: 0.91		Analysis Time..: 22:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.011	

Prep Batch #...: 0301021

Mercury	**0.043**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VP1AC**
		Dilution Factor: 1		Analysis Time..: 10:41	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-C

TOTAL Metals

Lot-Sample #...: C0J060555-008 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**0.62 ~~B~~ J**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AK**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.22	
Antimony	**0.086 ~~B~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AL**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0031	
Arsenic	**0.57**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AM**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VQ1AN
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0034	
Cadmium	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VQ1AP
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0085	
Chromium	**0.049 ~~B,J~~ B**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AQ**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0074	
Cobalt	**0.025 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AR**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0023	
Copper	**14.1**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AT**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0079	
Iron	**4.0 ~~B,J~~ B**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AU**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.27	

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Client Sample ID: PR-MOAM-FT-C

TOTAL Metals

Lot-Sample #...: C0J060555-008 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.036 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AV**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0032	
Manganese	**1.1 ~~J~~**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AW**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.013	
Nickel	**0.040 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1AX**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0063	
Selenium	**0.95 ~~J~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1A0**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.038	
Silver	**0.12**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1A1**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0022	
Thallium	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VQ1A2
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0019	
Tin	**0.15 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1A3**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.099	
Zinc	**10**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VQ1A4**
		Dilution Factor: 0.93		Analysis Time..: 22:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.011	

Prep Batch #...: 0301021

Mercury	**0.037**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VQ1AC**
		Dilution Factor: 1		Analysis Time..: 10:43	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

KW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-D

TOTAL Metals

Lot-Sample #...: C0J060555-009 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296044						
Aluminum	**0.39 ~~B~~ J**	**2.5**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AK**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.19	
Antimony	**0.023 ~~B~~ J**	**0.16**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AL**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0027	
Arsenic	**0.49**	**0.082**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AM**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.014	
Beryllium	ND	0.082	mg/kg	SW846 6020	10/23-10/29/10	L73VR1AN
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0030	
Cadmium	ND	0.082	mg/kg	SW846 6020	10/23-10/29/10	L73VR1AP
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0075	
Chromium	ND	0.16	mg/kg	SW846 6020	10/23-10/29/10	L73VR1AQ
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0066	
Cobalt	**0.032 ~~B~~ J**	**0.041**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AR**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Copper	**0.67**	**0.16**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AT**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0070	
Iron	**3.5 ~~B,J~~ B**	**4.1**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AU**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.24	

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-D

TOTAL Metals

Lot-Sample #...: C0J060555-009 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.033 ~~B~~ J**	**0.082**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AV**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0028	
Manganese	**1.3 ~~J~~**	**0.041**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AW**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.012	
Nickel	**0.033 ~~B~~ J**	**0.082**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1AX**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0056	
Selenium	**1.0 ~~J~~**	**0.41**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1A0**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.033	
Silver	ND	0.082	mg/kg	SW846 6020	10/23-10/29/10	L73VR1A1
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0020	
Thallium	ND	0.082	mg/kg	SW846 6020	10/23-10/29/10	L73VR1A2
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0016	
Tin	ND	0.41	mg/kg	SW846 6020	10/23-10/29/10	L73VR1A3
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.087	
Zinc	**31.5**	**0.41**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VR1A4**
		Dilution Factor: 0.82		Analysis Time..: 22:59	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296024	MDL.....: 0.0096	

Prep Batch #...: 0301021

Mercury	**0.045**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VR1AC**
		Dilution Factor: 1		Analysis Time..: 10:45	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301011	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-E

TOTAL Metals

Lot-Sample #...: C0J060555-010 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**0.98 ~~B~~ J**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AK**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.22	
Antimony	**0.021 ~~B~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AL**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Arsenic	**0.54**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AM**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VT1AN
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0034	
Cadmium	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VT1AP
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0085	
Chromium	ND	0.19	mg/kg	SW846 6020	10/23-10/29/10	L73VT1AQ
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0074	
Cobalt	**0.024 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AR**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Copper	**0.97 ~~B~~**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AT**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0079	
Iron	**3.9 ~~B~~ J**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AU**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.27	

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-E

TOTAL Metals

Lot-Sample #...: C0J060555-010 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.061 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AV**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Manganese	**2.7**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AW**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.013	
Nickel	**0.042 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1AX**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0063	
Selenium	**0.92 ~~B~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1A0**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.038	
Silver	ND	0.093	mg/kg	SW846 6020	10/23-10/29/10	L73VT1A1
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Thallium	**0.0052 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1A2**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0019	
Tin	**0.25 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1A3**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.099	
Zinc	**11.5 ~~J,E~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VT1A4**
		Dilution Factor: 0.93		Analysis Time..: 23:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.043**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VT1AC**
		Dilution Factor: 1		Analysis Time..: 10:50	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

E Matrix interference.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-A

TOTAL Metals

Lot-Sample #...: C0J060555-011 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**8.3**	**2.5**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AK**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.20	
Antimony	**0.019 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AL**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0027	
Arsenic	**0.70**	**0.083**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AM**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Beryllium	ND	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1AN
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Cadmium	ND	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1AP
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0076	
Chromium	**0.14 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AQ**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0066	
Cobalt	**0.067**	**0.042**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AR**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0021	
Copper	**15.1**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AT**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0071	
Iron	**89.3**	**4.2**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VV1AU**
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.24	

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-A

TOTAL Metals

Lot-Sample #...: C0J060555-011 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.71	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1AV
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0028	
Manganese	10.0	0.042	mg/kg	SW846 6020	10/23-10/29/10	L73VV1AW
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.012	
Nickel	0.086	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1AX
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0056	
Selenium	1.6 ~~B~~	0.42	mg/kg	SW846 6020	10/23-10/29/10	L73VV1A0
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.034	
Silver	0.21	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1A1
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0020	
Thallium	0.0095 ~~B~~ J	0.083	mg/kg	SW846 6020	10/23-10/29/10	L73VV1A2
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0017	
Tin	0.28 ~~B~~ J	0.42	mg/kg	SW846 6020	10/23-10/29/10	L73VV1A3
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.088	
Zinc	29.0 ~~J~~ J	0.42	mg/kg	SW846 6020	10/23-10/29/10	L73VV1A4
		Dilution Factor: 0.83		Analysis Time..: 23:38	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0097	

Prep Batch #...: 0301022

Mercury	0.022 ~~B~~ J	0.033	mg/kg	SW846 7471A	10/28/10	L73VV1AC
		Dilution Factor: 1		Analysis Time..: 10:55	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-B

TOTAL Metals

Lot-Sample #...: C0J060555-012 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**4.7**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AK**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.22	
Antimony	**0.014 ~~B~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AL**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Arsenic	**0.51**	**0.094**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AM**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.016	
Beryllium	ND	0.094	mg/kg	SW846 6020	10/23-10/29/10	L73VX1AN
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0035	
Cadmium	ND	0.094	mg/kg	SW846 6020	10/23-10/29/10	L73VX1AP
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0086	
Chromium	**0.16 B ~~J~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AQ**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0075	
Cobalt	**0.054**	**0.047**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AR**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0024	
Copper	**22.5 ~~J~~**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AT**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0080	
Iron	**45.5**	**4.7**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AU**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.27	

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Client Sample ID: CP-MOAM-WB-B

TOTAL Metals

Lot-Sample #...: C0J060555-012 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.37**	**0.094**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AV**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Manganese	**5.4**	**0.047**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AW**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Nickel	**0.074 ~~B~~ J**	**0.094**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1AX**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0064	
Selenium	**1.5 ~~J~~**	**0.47**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1A0**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.038	
Silver	**0.23**	**0.094**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1A1**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Thallium	**0.0054 ~~B~~ J**	**0.094**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1A2**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0019	
Tin	**0.18 ~~B~~ J**	**0.47**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1A3**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.10	
Zinc	**28.6 ~~J~~ J**	**0.47**	**mg/kg**	**SW846 6020**	**10/23-10/29/10**	**L73VX1A4**
		Dilution Factor: 0.94		Analysis Time..: 23:42	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.028 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73VX1AC**
		Dilution Factor: 1		Analysis Time..: 11:00	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-C

TOTAL Metals

Lot-Sample #...: C0J060555-013 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**30.5**	**2.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AK**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.21	
Antimony	**0.083 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AL**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0029	
Arsenic	**0.50**	**0.088**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AM**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.015	
Beryllium	ND	0.088	mg/kg	SW846 6020	10/23-10/30/10	L73V01AN
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0033	
Cadmium	ND	0.088	mg/kg	SW846 6020	10/23-10/30/10	L73V01AP
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0080	
Chromium	**0.25 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AQ**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0070	
Cobalt	**0.091**	**0.044**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AR**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Copper	**25.7 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AT**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0075	
Iron	**142**	**4.4**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AU**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.25	

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Client Sample ID: CP-MOAM-WB-C

TOTAL Metals

Lot-Sample #...: C0J060555-013 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.70**	**0.088**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AV**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0030	
Manganese	**13.7**	**0.044**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AW**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.013	
Nickel	**0.13**	**0.088**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01AX**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0060	
Selenium	**1.5 ~~J~~**	**0.44**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01A0**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.036	
Silver	**0.34**	**0.088**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01A1**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0021	
Thallium	ND	0.088	mg/kg	SW846 6020	10/23-10/30/10	L73V01A2
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0018	
Tin	**0.27 ~~B~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01A3**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.093	
Zinc	**24.8 ~~J~~ J**	**0.44**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V01A4**
		Dilution Factor: 0.88		Analysis Time..: 00:01	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.010	

Prep Batch #...: 0301022

Mercury	**0.033**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V01AC**
		Dilution Factor: 1		Analysis Time..: 11:02	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: CP-MOAM-WB-D

TOTAL Metals

Lot-Sample #...: C0J060555-014 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**5.6**	**2.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AK**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.20	
Antimony	**0.025 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AL**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0028	
Arsenic	**0.64**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AM**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Beryllium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V21AN
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Cadmium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V21AP
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0078	
Chromium	**0.11 ~~B,U~~ B**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AQ**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0069	
Cobalt	**0.046**	**0.043**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AR**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Copper	**34.1 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AT**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0073	
Iron	**58.9**	**4.3**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AU**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.25	

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Client Sample ID: CP-MOAM-WB-D

TOTAL Metals

Lot-Sample #...: C0J060555-014 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.47**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AV**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0029	
Manganese	**2.9**	**0.043**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AW**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.012	
Nickel	**0.069 ~~B~~ J**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21AX**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0058	
Selenium	**1.8 ~~B~~**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21A0**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.035	
Silver	**0.49**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21A1**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0021	
Thallium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V21A2
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0017	
Tin	**0.16 ~~B~~ J**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21A3**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.091	
Zinc	**28.7 ~~B~~ J**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V21A4**
		Dilution Factor: 0.86		Analysis Time..: 00:05	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.010	

Prep Batch #...: 0301022

Mercury	**0.034**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V21AC**
		Dilution Factor: 1		Analysis Time..: 11:04	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-E

TOTAL Metals

Lot-Sample #...: C0J060555-015 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**32.2**	**2.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AK**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.20	
Antimony	**0.021 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AL**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0028	
Arsenic	**0.57**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AM**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Beryllium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V31AN
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Cadmium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V31AP
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0078	
Chromium	**0.36 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AQ**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0069	
Cobalt	**0.11**	**0.043**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AR**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Copper	**22.3 ~~J~~**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AT**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0073	
Iron	**125**	**4.3**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AU**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.25	

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Client Sample ID: CP-MOAM-WB-E

TOTAL Metals

Lot-Sample #...: C0J060555-015 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.78**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AV**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0029	
Manganese	**14.7**	**0.043**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AW**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.012	
Nickel	**0.15**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31AX**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0058	
Selenium	**1.4 ~~B~~**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31A0**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.035	
Silver	**0.25**	**0.086**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31A1**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0021	
Thallium	ND	0.086	mg/kg	SW846 6020	10/23-10/30/10	L73V31A2
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0017	
Tin	**0.22 ~~B~~ J**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31A3**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.091	
Zinc	**32.1 ~~B~~ J**	**0.43**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V31A4**
		Dilution Factor: 0.86		Analysis Time..: 00:10	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.010	

Prep Batch #...: 0301022

Mercury	**0.031 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V31AC**
		Dilution Factor: 1		Analysis Time..: 11:05	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-A

TOTAL Metals

Lot-Sample #...: C0J060555-016 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**1.9** ~~B~~ J	**2.9**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AK**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.23	
Antimony	**0.014** ~~B~~ J	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AL**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Arsenic	**0.48**	**0.096**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AM**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.016	
Beryllium	ND	0.096	mg/kg	SW846 6020	10/23-10/30/10	L73V41AN
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0036	
Cadmium	ND	0.096	mg/kg	SW846 6020	10/23-10/30/10	L73V41AP
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0087	
Chromium	**0.072** ~~B,J~~ B	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AQ**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0077	
Cobalt	**0.030** ~~B~~ J	**0.048**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AR**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0024	
Copper	**4.5** ~~J~~	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AT**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0082	
Iron	**6.5**	**4.8**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AU**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.28	

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-A

TOTAL Metals

Lot-Sample #...: C0J060555-016 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.22**	**0.096**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AV**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0033	
Manganese	**3.1**	**0.048**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AW**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Nickel	**0.051 ~~B~~ J**	**0.096**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41AX**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0065	
Selenium	**0.78 ~~J~~**	**0.48**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41A0**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.039	
Silver	**0.042 ~~B~~ J**	**0.096**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41A1**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Thallium	ND	0.096	mg/kg	SW846 6020	10/23-10/30/10	L73V41A2
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0019	
Tin	**0.14 ~~B~~ J**	**0.48**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41A3**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.10	
Zinc	**11.1 ~~J~~ J**	**0.48**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V41A4**
		Dilution Factor: 0.96		Analysis Time..: 00:14	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.037**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V41AC**
		Dilution Factor: 1		Analysis Time..: 11:07	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

KW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-B

TOTAL Metals

Lot-Sample #...: C0J060555-017 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**1.3 ~~B~~ J**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AK**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.22	
Antimony	**0.012 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AL**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0030	
Arsenic	**0.32**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AM**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.015	
Beryllium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V51AN
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0034	
Cadmium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V51AP
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0084	
Chromium	ND	0.18	mg/kg	SW846 6020	10/23-10/30/10	L73V51AQ
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0074	
Cobalt	**0.029 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AR**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Copper	**0.99 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AT**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0078	
Iron	**4.7**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AU**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.27	

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Client Sample ID: CP-MOAM-FT-B

TOTAL Metals

Lot-Sample #...: C0J060555-017 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.16**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AV**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Manganese	**2.3**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AW**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.013	
Nickel	**0.062 ~~B~~ J**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51AX**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0063	
Selenium	**0.87 ~~J~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51A0**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.037	
Silver	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V51A1
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Thallium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V51A2
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0018	
Tin	ND	0.46	mg/kg	SW846 6020	10/23-10/30/10	L73V51A3
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.098	
Zinc	**13.6 ~~J~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V51A4**
		Dilution Factor: 0.92		Analysis Time..: 00:18	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.047**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V51AC**
		Dilution Factor: 1		Analysis Time..: 11:09	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-C

TOTAL Metals

Lot-Sample #...: C0J060555-018 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**1.6 ~~B~~ J**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AK**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.22	
Antimony	**0.011 ~~B~~ J**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AL**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Arsenic	**0.39**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AM**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	10/23-10/30/10	L73V61AN
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0034	
Cadmium	ND	0.093	mg/kg	SW846 6020	10/23-10/30/10	L73V61AP
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0085	
Chromium	**0.010 ~~B,J~~ B**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AQ**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0074	
Cobalt	**0.018 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AR**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Copper	**2.1 ~~J~~**	**0.19**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AT**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0079	
Iron	**4.3 ~~B~~ J**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AU**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.27	

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-C

TOTAL Metals

Lot-Sample #...: C0J060555-018 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.20**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AV**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0032	
Manganese	**1.9**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AW**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.013	
Nickel	**0.035 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61AX**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0063	
Selenium	**0.97 ~~B~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61A0**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.038	
Silver	**0.018 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61A1**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Thallium	ND	0.093	mg/kg	SW846 6020	10/23-10/30/10	L73V61A2
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0019	
Tin	**0.11 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61A3**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.099	
Zinc	**11.0 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V61A4**
		Dilution Factor: 0.93		Analysis Time..: 00:23	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.056**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V61AC**
		Dilution Factor: 1		Analysis Time..: 11:11	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-D

TOTAL Metals

Lot-Sample #...: C0J060555-019 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**2.0 ~~B~~ J**	**2.8**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AK**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.22	
Antimony	**0.0086 ~~B~~ J**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AL**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0030	
Arsenic	**0.38**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AM**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.015	
Beryllium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V71AN
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0034	
Cadmium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V71AP
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0084	
Chromium	ND	0.18	mg/kg	SW846 6020	10/23-10/30/10	L73V71AQ
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0074	
Cobalt	**0.031 ~~B~~ J**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AR**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0023	
Copper	**1.2 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AT**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0078	
Iron	**7.8**	**4.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AU**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.27	

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NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-D

TOTAL Metals

Lot-Sample #...: C0J060555-019 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.26**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AV**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Manganese	**4.0**	**0.046**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AW**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.013	
Nickel	**0.057 ~~B~~ J**	**0.092**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71AX**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0063	
Selenium	**0.76 ~~J~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71A0**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.037	
Silver	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V71A1
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0022	
Thallium	ND	0.092	mg/kg	SW846 6020	10/23-10/30/10	L73V71A2
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0018	
Tin	**0.11 ~~B~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71A3**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.098	
Zinc	**11.8 ~~J~~ J**	**0.46**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V71A4**
		Dilution Factor: 0.92		Analysis Time..: 00:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.011	

Prep Batch #...: 0301022

Mercury	**0.054**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V71AC**
		Dilution Factor: 1		Analysis Time..: 11:12	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

HW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-E

TOTAL Metals

Lot-Sample #...: C0J060555-020 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**0.67 ~~B~~ J**	**2.6**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AK**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.20	
Antimony	**0.0046 ~~B~~ J**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AL**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0028	
Arsenic	**0.37**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AM**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	10/23-10/30/10	L73V81AN
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0031	
Cadmium	ND	0.085	mg/kg	SW846 6020	10/23-10/30/10	L73V81AP
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0077	
Chromium	ND	0.17	mg/kg	SW846 6020	10/23-10/30/10	L73V81AQ
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0068	
Cobalt	**0.014 ~~B~~ J**	**0.042**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AR**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0021	
Copper	**0.75 ~~B~~**	**0.17**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AT**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0072	
Iron	**3.6 ~~B~~ J**	**4.2**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AU**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.25	

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MW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-E

TOTAL Metals

Lot-Sample #...: C0J060555-020 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.082 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AV**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0029	
Manganese	**1.4**	**0.042**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AW**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.012	
Nickel	**0.031 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81AX**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0058	
Selenium	**0.85 ~~J~~**	**0.42**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81A0**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.035	
Silver	ND	0.085	mg/kg	SW846 6020	10/23-10/30/10	L73V81A1
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0020	
Thallium	ND	0.085	mg/kg	SW846 6020	10/23-10/30/10	L73V81A2
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0017	
Tin	ND	0.42	mg/kg	SW846 6020	10/23-10/30/10	L73V81A3
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.090	
Zinc	**9.4 ~~J~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L73V81A4**
		Dilution Factor: 0.85		Analysis Time..: 00:31	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0099	

Prep Batch #...: 0301022

Mercury	**0.048**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L73V81AC**
		Dilution Factor: 1		Analysis Time..: 11:14	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW 12/8/10

EA Engineering, Science and Technology

Client Sample ID: SRM 1

TOTAL Metals

Lot-Sample #...: C0J060555-021 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0296045						
Aluminum	**32.4**	**3.0**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AD**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.24	
Antimony	**0.022 ~~B~~ J**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AE**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0033	
Arsenic	**6.9**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AF**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.016	
Beryllium	**0.0049 ~~B~~ J**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AG**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0037	
Cadmium	**2.3**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AH**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0091	
Chromium	ND	0.20	mg/kg	SW846 6020	10/23-10/30/10	L733E1AJ
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0080	
Cobalt	**0.29**	**0.050**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AK**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0025	
Copper	**60.8 ~~J~~**	**0.20**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AL**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0085	
Iron	**151**	**5.0**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AM**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.29	

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MW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: SRM 1

TOTAL Metals

Lot-Sample #...: C0J060555-021 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.28**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AN**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0034	
Manganese	**15.2**	**0.050**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AP**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.014	
Nickel	**0.80**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AQ**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0068	
Selenium	**2.5 ~~B~~**	**0.50**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AR**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.041	
Silver	**0.62**	**0.10**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AT**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0024	
Thallium	ND	0.10	mg/kg	SW846 6020	10/23-10/30/10	L733E1AU
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.0020	
Tin	ND	0.50	mg/kg	SW846 6020	10/23-10/30/10	L733E1AV
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.11	
Zinc	**1250 ~~B~~ J**	**0.50**	**mg/kg**	**SW846 6020**	**10/23-10/30/10**	**L733E1AW**
		Dilution Factor: 1		Analysis Time..: 00:36	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0296025	MDL.....: 0.012	
Prep Batch #...: 0301022						
Mercury	**0.040**	**0.033**	**mg/kg**	**SW846 7471A**	**10/28/10**	**L733E1AX**
		Dilution Factor: 1		Analysis Time..: 11:16	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0301012	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
12/8/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060555

Client: Maryland Environmental Service, Millersville, MD Date: December 8, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-MOAM-WB-A	C0J06055-001	Tissue
2	PR-MOAM-WB-B	C0J06055-002	Tissue
3	PR-MOAM-WB-C	C0J06055-003	Tissue
4	PR-MOAM-WB-D	C0J06055-004	Tissue
5	PR-MOAM-WB-E	C0J06055-005	Tissue
5MS	PR-MOAM-WB-EMS	C0J06055-005MS	Tissue
5MSD	PR-MOAM-WB-EMSD	C0J06055-005MSD	Tissue
6	PR-MOAM-FT-A	C0J06055-006	Tissue
7	PR-MOAM-FT-B	C0J06055-007	Tissue
8	PR-MOAM-FT-C	C0J06055-008	Tissue
9	PR-MOAM-FT-D	C0J06055-009	Tissue
10	PR-MOAM-FT-E	C0J06055-010	Tissue
10MS	PR-MOAM-FT-EMS	C0J06055-010MS	Tissue
10MSD	PR-MOAM-FT-EMSD	C0J06055-010MSD	Tissue
11	CP-MOAM-WB-A	C0J06055-011	Tissue
12	CP-MOAM-WB-B	C0J06055-012	Tissue
13	CP-MOAM-WB-C	C0J06055-013	Tissue
14	CP-MOAM-WB-D	C0J06055-014	Tissue
15	CP-MOAM-WB-E	C0J06055-015	Tissue
16	CP-MOAM-FT-A	C0J06055-016	Tissue
17	CP-MOAM-FT-B	C0J06055-017	Tissue
18	CP-MOAM-FT-C	C0J06055-018	Tissue
19	CP-MOAM-FT-D	C0J06055-019	Tissue
20	CP-MOAM-FT-E	C0J06055-020	Tissue
21	SRM 1	C0J06055-021	Tissue

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - The continuing calibration exhibited acceptable %D values.

Surrogates - All samples exhibited acceptable surrogate recoveries.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
10	PCB 101	47%/38%/OK	L/UL

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - Several compounds were flagged (PG) by the laboratory indicating that the percent difference (% D) between the original and confirmation analyses is greater than 40%. The reviewer flagged these and all results with >25% D as estimated (J).

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-A

GC Semivolatiles

Lot-Sample #...:	C0J060555-001	Work Order #...:	L73T21AC	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	18:22		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	71	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	4.3	2.0	ug/kg	0.67
PCB 28 (BZ)	6.5 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	7.4	2.0	ug/kg	0.92
PCB 49 (BZ)	8.6 ~~PG~~ J	2.0	ug/kg	0.97
PCB 52 (BZ)	13 J	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	15	2.0	ug/kg	0.69
PCB 105 (BZ)	4.7	2.0	ug/kg	1.1
PCB 118 (BZ)	7.7 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	6.5	2.0	ug/kg	0.85
PCB 138 (BZ)	21 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	41	2.0	ug/kg	0.73
PCB 156 (BZ)	3.3 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	12	2.0	ug/kg	0.82
PCB 180 (BZ)	12 ~~PG~~ J	2.0	ug/kg	0.79
PCB 183 (BZ)	4.9 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	21	2.0	ug/kg	1.0
PCB 195 (BZ)	1.4 J	2.0	ug/kg	1.0
PCB 206 (BZ)	6.8	2.0	ug/kg	1.0
PCB 209 (BZ)	5.3	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	48	(35 - 140)

NOTE(S):

PG The percent difference between the origina. and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

LW
12/8/10

2

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-B

GC Semivolatiles

Lot-Sample #...:	C0J060555-002	Work Order #...:	L73VE1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	18:47		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	69	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	6.5	2.0	ug/kg	0.67
PCB 28 (BZ)	8.2 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	10	2.0	ug/kg	0.92
PCB 49 (BZ)	18	2.0	ug/kg	0.97
PCB 52 (BZ)	19	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	18	2.0	ug/kg	0.69
PCB 105 (BZ)	3.4 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	8.2 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	8.0	2.0	ug/kg	0.85
PCB 138 (BZ)	21 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	42	2.0	ug/kg	0.73
PCB 156 (BZ)	3.7 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	14	2.0	ug/kg	0.82
PCB 180 (BZ)	18 J	2.0	ug/kg	0.79
PCB 183 (BZ)	4.7 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	23	2.0	ug/kg	1.0
PCB 195 (BZ)	1.6 J	2.0	ug/kg	1.0
PCB 206 (BZ)	7.4	2.0	ug/kg	1.0
PCB 209 (BZ)	5.9	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	47	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

hu
12/8/10

3

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-C

GC Semivolatiles

Lot-Sample #...:	C0J060555-003	Work Order #...:	L73VG1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	19:12		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	69	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	5.7	2.0	ug/kg	0.67
PCB 28 (BZ)	7.5 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	11	2.0	ug/kg	0.92
PCB 49 (BZ)	18	2.0	ug/kg	0.97
PCB 52 (BZ)	20	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	22	2.0	ug/kg	0.69
PCB 105 (BZ)	4.1 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	9.4 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	9.1	2.0	ug/kg	0.85
PCB 138 (BZ)	24 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	46	2.0	ug/kg	0.73
PCB 156 (BZ)	4.2 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	16	2.0	ug/kg	0.82
PCB 180 (BZ)	20 J	2.0	ug/kg	0.79
PCB 183 (BZ)	4.7 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	27	2.0	ug/kg	1.0
PCB 195 (BZ)	1.9 J	2.0	ug/kg	1.0
PCB 206 (BZ)	8.6	2.0	ug/kg	1.0
PCB 209 (BZ)	6.2	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	49	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

NW
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4

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-D

GC Semivolatiles

Lot-Sample #...:	C0J060555-004	Work Order #...:	L73VH1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	19:37		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	71	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	4.7	2.0	ug/kg	0.67
PCB 28 (BZ)	6.2 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	8.5 J	2.0	ug/kg	0.92
PCB 49 (BZ)	11	2.0	ug/kg	0.97
PCB 52 (BZ)	13	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	20	2.0	ug/kg	0.69
PCB 105 (BZ)	4.0 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	9.8 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	8.8	2.0	ug/kg	0.85
PCB 138 (BZ)	26 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	54	2.0	ug/kg	0.73
PCB 156 (BZ)	5.0 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	17	2.0	ug/kg	0.82
PCB 180 (BZ)	23 J	2.0	ug/kg	0.79
PCB 183 (BZ)	5.7 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	32	2.0	ug/kg	1.0
PCB 195 (BZ)	2.1	2.0	ug/kg	1.0
PCB 206 (BZ)	9.5	2.0	ug/kg	1.0
PCB 209 (BZ)	7.5	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
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5

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-E

GC Semivolatiles

Lot-Sample #...:	C0J060555-005	Work Order #...:	L73VJ1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	20:02		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	71	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	3.0	2.0	ug/kg	0.67
PCB 28 (BZ)	4.4 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	4.5	2.0	ug/kg	0.92
PCB 49 (BZ)	8.1	2.0	ug/kg	0.97
PCB 52 (BZ)	8.0	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	8.6	2.0	ug/kg	0.69
PCB 105 (BZ)	2.3 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	5.2 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	4.1	2.0	ug/kg	0.85
PCB 138 (BZ)	13 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	28	2.0	ug/kg	0.73
PCB 156 (BZ)	2.4 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	9.1	2.0	ug/kg	0.82
PCB 180 (BZ)	12 J	2.0	ug/kg	0.79
PCB 183 (BZ)	3.4 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	15	2.0	ug/kg	1.0
PCB 195 (BZ)	1.2 J	2.0	ug/kg	1.0
PCB 206 (BZ)	5.9	2.0	ug/kg	1.0
PCB 209 (BZ)	4.9	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

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6

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-A

GC Semivolatiles

Lot-Sample #...:	C0J060555-006	Work Order #...:	L73VM1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	21:17		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	78	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**2.7**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**3.4 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**5.3**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**7.2**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**8.8**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**8.3**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.6 ~~J,PG~~ J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**3.9 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**2.8**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**8.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**15**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.4 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**5.3 J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**6.4 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**2.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**7.6**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**4.7**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**4.9**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-B

GC Semivolatiles

Lot-Sample #...:	C0J060555-007	Work Order #...:	L73VP1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	21:42		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	75	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**2.6**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**3.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**4.1**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**6.2**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**6.8**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**6.9**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.2 ~~J,PG~~ J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**3.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**3.2**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**9.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**17**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.6 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**6.1**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**8.0 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**2.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**9.4**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**3.5**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**3.2**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

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12/8/10

8

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-C

GC Semivolatiles

Lot-Sample #...:	C0J060555-008	Work Order #...:	L73VQ1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	22:07		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	74	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**2.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**3.2**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**5.0**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**5.6**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**5.7**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.7 ~~J~~ J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**2.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**2.3**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**7.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**14**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.1 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**4.6 J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**4.1 ~~PG~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**1.6 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**7.5**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**2.7**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**2.6**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/8/10

9

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-D

GC Semivolatiles

Lot-Sample #...:	C0J060555-009	Work Order #...:	L73VR1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	22:32		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	74	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	4.6	2.0	ug/kg	0.67
PCB 28 (BZ)	5.9 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	7.9	2.0	ug/kg	0.92
PCB 49 (BZ)	13	2.0	ug/kg	0.97
PCB 52 (BZ)	14	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	16	2.0	ug/kg	0.69
PCB 105 (BZ)	3.1 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	7.2 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	7.1	2.0	ug/kg	0.85
PCB 138 (BZ)	20 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	38	2.0	ug/kg	0.73
PCB 156 (BZ)	3.5 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	13	2.0	ug/kg	0.82
PCB 180 (BZ)	12 ~~PG~~ J	2.0	ug/kg	0.79
PCB 183 (BZ)	4.4 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	21	2.0	ug/kg	1.0
PCB 195 (BZ)	1.8 J	2.0	ug/kg	1.0
PCB 206 (BZ)	8.9	2.0	ug/kg	1.0
PCB 209 (BZ)	8.4	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	51	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

hw
12/8/10

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-E

GC Semivolatiles

Lot-Sample #...:	C0J060555-010	Work Order #...:	L73VT1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/15/10		
Prep Batch #...:	0314059	Analysis Time..:	22:57		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	76	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**2.1**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**2.8 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**3.3**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**5.3**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**5.8**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**6.2 L**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**2.9 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**2.6**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**12 J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**16**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.3 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**5.3**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**6.7 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**2.8 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**8.5**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**3.7**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**3.5**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	53	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

hw
12/8/10

11

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-A

GC Semivolatiles

Lot-Sample #...:	C0J060555-011	Work Order #...:	L73VV1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	00:12		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	71	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	5.9	2.0	ug/kg	0.67
PCB 28 (BZ)	7.3 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	12	2.0	ug/kg	0.92
PCB 49 (BZ)	19	2.0	ug/kg	0.97
PCB 52 (BZ)	22	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	26	2.0	ug/kg	0.69
PCB 105 (BZ)	7.5	2.0	ug/kg	1.1
PCB 118 (BZ)	12 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	10	2.0	ug/kg	0.85
PCB 138 (BZ)	29 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	55	2.0	ug/kg	0.73
PCB 156 (BZ)	5.1 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	18	2.0	ug/kg	0.82
PCB 180 (BZ)	22 J	2.0	ug/kg	0.79
PCB 183 (BZ)	7.4 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	29	2.0	ug/kg	1.0
PCB 195 (BZ)	2.1	2.0	ug/kg	1.0
PCB 206 (BZ)	13	2.0	ug/kg	1.0
PCB 209 (BZ)	11	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	49	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/8/10

12

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-B

GC Semivolatiles

Lot-Sample #...:	C0J060555-012	Work Order #...:	L73VX1AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	00:38		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	73	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**4.0**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**5.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**9.2 J**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**15**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**17**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**22**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**6.9 J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**11 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**8.4**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**27 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**50**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**4.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**16**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**21 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**6.4 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**26**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**1.0**
PCB 206 (BZ)	**13**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**11**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-C

GC Semivolatiles

Lot-Sample #...:	C0J060555-013	Work Order #...:	L73V01AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	01:03		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	72	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	3.5	2.0	ug/kg	0.67
PCB 28 (BZ)	5.0 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	8.8	2.0	ug/kg	0.92
PCB 49 (BZ)	13	2.0	ug/kg	0.97
PCB 52 (BZ)	15	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	21	2.0	ug/kg	0.69
PCB 105 (BZ)	4.1 ~~PG~~ J	2.0	ug/kg	1.1
PCB 118 (BZ)	10 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	8.6	2.0	ug/kg	0.85
PCB 138 (BZ)	25 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	51	2.0	ug/kg	0.73
PCB 156 (BZ)	5.0 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	18	2.0	ug/kg	0.82
PCB 180 (BZ)	23 J	2.0	ug/kg	0.79
PCB 183 (BZ)	6.5 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	26	2.0	ug/kg	1.0
PCB 195 (BZ)	2.4	2.0	ug/kg	1.0
PCB 206 (BZ)	17	2.0	ug/kg	1.0
PCB 209 (BZ)	14	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	49	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-D

GC Semivolatiles

Lot-Sample #...:	C0J060555-014	Work Order #...:	L73V21AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	01:27		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	73	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**4.4**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**5.5 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**10**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**16**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**19**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**26**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**7.8 J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**12 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**9.7**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**45 J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**59**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**5.7 ~~PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**21**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**19 ~~PG~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**8.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**30**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	**2.6**	**2.0**	**ug/kg**	**1.0**
PCB 206 (BZ)	**21**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**20**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-E

GC Semivolatiles

Lot-Sample #...:	C0J060555-015	Work Order #...:	L73V31AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	03:08		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	73	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	3.1	2.0	ug/kg	0.67
PCB 28 (BZ)	4.3 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	7.6	2.0	ug/kg	0.92
PCB 49 (BZ)	12	2.0	ug/kg	0.97
PCB 52 (BZ)	14	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	19	2.0	ug/kg	0.69
PCB 105 (BZ)	5.9 J	2.0	ug/kg	1.1
PCB 118 (BZ)	9.5 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	7.9	2.0	ug/kg	0.85
PCB 138 (BZ)	25 ~~PG~~ J	2.0	ug/kg	0.67
PCB 153 (BZ)	47	2.0	ug/kg	0.73
PCB 156 (BZ)	4.3 ~~PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	16	2.0	ug/kg	0.82
PCB 180 (BZ)	14 ~~PG~~ J	2.0	ug/kg	0.79
PCB 183 (BZ)	6.5 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	26	2.0	ug/kg	1.0
PCB 195 (BZ)	1.9 J	2.0	ug/kg	1.0
PCB 206 (BZ)	13	2.0	ug/kg	1.0
PCB 209 (BZ)	11	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	47	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

JLW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-A

GC Semivolatiles

Lot-Sample #...:	C0J060555-016	Work Order #...:	L73V41AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	03:32		
Dilution Factor:	1	Initial Wgt/Vol:	1.3 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	78	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**1.4 J**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**1.6 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**2.6**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**4.1**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**4.9**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**6.3**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.9 ~~J~~ J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**3.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**2.3**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**7.7 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**15**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.3 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**5.5 J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**6.3 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**3.1 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**8.2**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**6.4**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**6.7**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	53	(35 - 140)
PCB 205 (BZ)	47	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/8/10

17

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-B

GC Semivolatiles

Lot-Sample #...:	C0J060555-017	Work Order #...:	L73V51AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	03:57		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	77	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**1.8 J**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**2.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**3.8 J**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**6.1**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**6.9**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**9.1**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**2.6**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**4.2 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**3.5**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**16 J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**21**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.8 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**7.3**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**6.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**4.2 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**11**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**6.3**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**6.0**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	53	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-C

GC Semivolatiles

Lot-Sample #...:	C0J060555-018	Work Order #...:	L73V61AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	04:23		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	76	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**0.95 J**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**1.3 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**1.7 J**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**1.5 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**3.2 J**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**4.2**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**1.1 ~~J,PG~~ J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**2.5 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**1.6 J**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**8.6 J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**12**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**0.88 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**3.7 J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**3.2 ~~PG~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**1.7 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**5.5**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**3.2**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**3.4**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW 12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-D

GC Semivolatiles

Lot-Sample #...:	C0J060555-019	Work Order #...:	L73V71AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	04:48		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	78	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**1.1 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**2.0**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**3.3**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**3.8**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**6.8**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**2.0 J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**3.5 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**2.8**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**15 J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**20**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**1.7 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**7.4**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**6.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**2.7 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**11**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	**7.3**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**6.7**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

JW
12/8/10

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-E

GC Semivolatiles

Lot-Sample #...:	C0J060555-020	Work Order #...:	L73V81AJ	Matrix.....:	BIOLOGIC
Date Sampled...:	10/01/10	Date Received..:	10/06/10	MS Run #.....:	0314035
Prep Date.....:	11/10/10	Analysis Date..:	11/16/10		
Prep Batch #...:	0314059	Analysis Time..:	05:12		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:	76	Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	1.7 J	2.0	ug/kg	0.67
PCB 28 (BZ)	2.0 ~~PG~~ J	2.0	ug/kg	0.84
PCB 44 (BZ)	2.3	2.0	ug/kg	0.92
PCB 49 (BZ)	4.1	2.0	ug/kg	0.97
PCB 52 (BZ)	4.6	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	5.5	2.0	ug/kg	0.69
PCB 105 (BZ)	1.8 J	2.0	ug/kg	1.1
PCB 118 (BZ)	3.0 ~~PG~~ J	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	2.6	2.0	ug/kg	0.85
PCB 138 (BZ)	11 J	2.0	ug/kg	0.67
PCB 153 (BZ)	16	2.0	ug/kg	0.73
PCB 156 (BZ)	1.4 ~~J, PG~~ J	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	6.3	2.0	ug/kg	0.82
PCB 180 (BZ)	5.6 ~~PG~~ J	2.0	ug/kg	0.79
PCB 183 (BZ)	2.5 ~~PG~~ J	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	8.5	2.0	ug/kg	1.0
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	4.6	2.0	ug/kg	1.0
PCB 209 (BZ)	4.4	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	47	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW 12/8/10

EA Engineering, Science and Technology

Client Sample ID: SRM 1

GC Semivolatiles

Lot-Sample #...:	C0J060555-021	**Work Order #...:**	L733E1AC	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0314035
Prep Date.....:	11/10/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0314059	**Analysis Time..:**	13:28		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:		**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**2.7**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**6.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**4.7**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**6.7**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**7.5**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	**4.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**7.0**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**5.6**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**5.7 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**15**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**15 J**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND ~~PG~~	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.1 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**1.2 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**3.2**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/8/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS (PAH ONLY)

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J060555

Client: Maryland Environmental Service, Millersville, MD Date: December 8, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-MOAM-WB-A	C0J06055-001	Tissue
2	PR-MOAM-WB-B	C0J06055-002	Tissue
3	PR-MOAM-WB-C	C0J06055-003	Tissue
4	PR-MOAM-WB-D	C0J06055-004	Tissue
5	PR-MOAM-WB-E	C0J06055-005	Tissue
5MS	PR-MOAM-WB-EMS	C0J06055-005MS	Tissue
5MSD	PR-MOAM-WB-EMSD	C0J06055-005MSD	Tissue
6	PR-MOAM-FT-A	C0J06055-006	Tissue
7	PR-MOAM-FT-B	C0J06055-007	Tissue
8	PR-MOAM-FT-C	C0J06055-008	Tissue
9	PR-MOAM-FT-D	C0J06055-009	Tissue
10	PR-MOAM-FT-E	C0J06055-010	Tissue
10MS	PR-MOAM-FT-EMS	C0J06055-010MS	Tissue
10MSD	PR-MOAM-FT-EMSD	C0J06055-010MSD	Tissue
11	CP-MOAM-WB-A	C0J06055-011	Tissue
12	CP-MOAM-WB-B	C0J06055-012	Tissue
13	CP-MOAM-WB-C	C0J06055-013	Tissue
14	CP-MOAM-WB-D	C0J06055-014	Tissue
15	CP-MOAM-WB-E	C0J06055-015	Tissue
16	CP-MOAM-FT-A	C0J06055-016	Tissue
17	CP-MOAM-FT-B	C0J06055-017	Tissue
18	CP-MOAM-FT-C	C0J06055-018	Tissue
19	CP-MOAM-FT-D	C0J06055-019	Tissue
20	CP-MOAM-FT-E	C0J06055-020	Tissue
21	SRM 1	C0J06055-021	Tissue

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 14 days for tissue samples and analyzed within 40 days for all samples.

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
1	S2= Terphenyl-d14	8.5%	L/R
2	S2= Terphenyl-d14	12%	None for one out per fraction
3	S2= Terphenyl-d14	21%	
4	S2= Terphenyl-d14	22%	
5	S2= Terphenyl-d14	10%	
11	S2= Terphenyl-d14	18%	
12	S2= Terphenyl-d14	31%	
13	S2= Terphenyl-d14	34%	
15	S2= Terphenyl-d14	35%	
20	S2= Terphenyl-d14	27%	

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
5	Acenaphthene	OK/OK/51	None for RPD alone
	Pyrene	18%/OK/OK	L/UL
	Naphthalene	OK/OK/54	None for RPD alone

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria except the following.

Sample ID	Internal Standard	Area Count	Qualifier
1	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
2	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
3	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
4	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	

Sample ID	Internal Standard	Area Count	Qualifier
5	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
6	IS6= Perylene-d12	High	
7	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
8	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
9	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
10	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
11	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	
12	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
13	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
14	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
15	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	
16	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
17	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
18	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
19	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
20	IS5= Chrysene-d12	High	
21	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	

Method Blank - The method blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - Several compounds in several samples were analyzed at various dilutions due to high concentrations of target compounds.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-001	**Work Order #...:**	L73T21AA	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	04:15		
Dilution Factor:	1.2	**Initial Wgt/Vol:**	25.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	71	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	~~ND~~ R	8.0	ug/kg	0.80
Acenaphthene	**4.6 ~~J~~ L**	**8.0**	**ug/kg**	**0.77**
Acenaphthylene	**1.9 ~~J~~ L**	**8.0**	**ug/kg**	**0.92**
Anthracene	~~ND~~ R	8.0	ug/kg	0.78
Benzo(a)anthracene	~~ND~~	8.0	ug/kg	1.0
Benzo(b)fluoranthene	~~ND~~	8.0	ug/kg	1.3
Benzo(k)fluoranthene	~~ND~~	8.0	ug/kg	1.6
Benzo(ghi)perylene	~~ND~~	8.0	ug/kg	0.80
Chrysene	~~ND~~	8.0	ug/kg	0.95
Dibenz(a,h)anthracene	~~ND~~	8.0	ug/kg	0.89
Fluoranthene	~~ND~~	8.0	ug/kg	0.86
Fluorene	**3.7 ~~J~~ L**	**8.0**	**ug/kg**	**1.1**
Indeno(1,2,3-cd)pyrene	~~ND~~ R	8.0	ug/kg	0.82
Naphthalene	~~ND~~	8.0	ug/kg	0.69
Phenanthrene	~~ND~~	8.0	ug/kg	1.3
Pyrene	~~ND~~	8.0	ug/kg	0.81
2-Methylnaphthalene	~~ND~~	8.0	ug/kg	0.72
1-Methylnaphthalene	~~ND~~	8.0	ug/kg	0.85

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	53	(42 - 110)
Terphenyl-d14	8.5 *	(37 - 137)
2-Fluorobiphenyl	56	(43 - 110)
2-Fluorophenol	63	(11 - 116)
Phenol-d5	61	(25 - 115)
2,4,6-Tribromophenol	54	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

LW
12/8/10

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-002	**Work Order #...:**	L73VE1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	04:35		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	69	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	**5.1 J**	**16**	**ug/kg**	**1.5**
Acenaphthylene	**1.9 J**	**16**	**ug/kg**	**1.8**
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	**4.4 J**	**16**	**ug/kg**	**1.4**
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(42 - 110)
Terphenyl-d14	12 *	(37 - 137)
2-Fluorobiphenyl	70	(43 - 110)
2-Fluorophenol	76	(11 - 116)
Phenol-d5	75	(25 - 115)
2,4,6-Tribromophenol	63	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-C

GC/MS Semivolatiles

Lot-Sample #...: C0J060555-003	**Work Order #...:** L73VG1AH	**Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10	**Date Received..:** 10/06/10	**MS Run #.....:** 0313027
Prep Date.....: 11/09/10	**Analysis Date..:** 11/15/10	
Prep Batch #...: 0313047	**Analysis Time..:** 04:54	
Dilution Factor: 1.2	**Initial Wgt/Vol:** 25.1 g	**Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 69	**Analyst ID.....:** 007062	**Instrument ID..:** 722
	Method.....: SW846 8270C	

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	8.0	ug/kg	0.80
Acenaphthene	ND	8.0	ug/kg	0.77
Acenaphthylene	ND	8.0	ug/kg	0.92
Anthracene	ND	8.0	ug/kg	0.78
Benzo(a)anthracene	ND	8.0	ug/kg	1.0
Benzo(b)fluoranthene	ND	8.0	ug/kg	1.3
Benzo(k)fluoranthene	ND	8.0	ug/kg	1.6
Benzo(ghi)perylene	ND	8.0	ug/kg	0.80
Chrysene	ND	8.0	ug/kg	0.95
Dibenz(a,h)anthracene	ND	8.0	ug/kg	0.89
Fluoranthene	ND	8.0	ug/kg	0.86
Fluorene	**5.2 J**	**8.0**	**ug/kg**	**1.1**
Indeno(1,2,3-cd)pyrene	ND	8.0	ug/kg	0.82
Naphthalene	ND	8.0	ug/kg	0.69
Phenanthrene	**10**	**8.0**	**ug/kg**	**1.3**
Pyrene	ND	8.0	ug/kg	0.81
2-Methylnaphthalene	ND	8.0	ug/kg	0.72
1-Methylnaphthalene	ND	8.0	ug/kg	0.85

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	67	(42 - 110)
Terphenyl-d14	21 *	(37 - 137)
2-Fluorobiphenyl	68	(43 - 110)
2-Fluorophenol	76	(11 - 116)
Phenol-d5	80	(25 - 115)
2,4,6-Tribromophenol	63	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

hd
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-004	**Work Order #...:**	L73VH1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	05:14		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	71	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	60	(42 - 110)
Terphenyl-d14	22 *	(37 - 137)
2-Fluorobiphenyl	60	(43 - 110)
2-Fluorophenol	63	(11 - 116)
Phenol-d5	63	(25 - 115)
2,4,6-Tribromophenol	59	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-WB-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-005	**Work Order #...:**	L73VJ1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	05:33		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	71	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	~~ND~~ UL	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	55	(42 - 110)
Terphenyl-d14	10 *	(37 - 137)
2-Fluorobiphenyl	56	(43 - 110)
2-Fluorophenol	61	(11 - 116)
Phenol-d5	62	(25 - 115)
2,4,6-Tribromophenol	59	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

MW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-006	**Work Order #...:**	L73VM1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	06:32		
Dilution Factor:	3	**Initial Wgt/Vol:**	20 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	78	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	20	ug/kg	2.0
Acenaphthene	ND	20	ug/kg	1.9
Acenaphthylene	ND	20	ug/kg	2.3
Anthracene	ND	20	ug/kg	2.0
Benzo(a)anthracene	ND	20	ug/kg	2.5
Benzo(b)fluoranthene	ND	20	ug/kg	3.1
Benzo(k)fluoranthene	ND	20	ug/kg	4.0
Benzo(ghi)perylene	ND	20	ug/kg	2.0
Chrysene	ND	20	ug/kg	2.4
Dibenz(a,h)anthracene	ND	20	ug/kg	2.2
Fluoranthene	ND	20	ug/kg	2.1
Fluorene	ND	20	ug/kg	2.6
Indeno(1,2,3-cd)pyrene	ND	20	ug/kg	2.1
Naphthalene	**6.6 J**	**20**	**ug/kg**	**1.7**
Phenanthrene	ND	20	ug/kg	3.2
Pyrene	ND	20	ug/kg	2.0
2-Methylnaphthalene	ND	20	ug/kg	1.8
1-Methylnaphthalene	ND	20	ug/kg	2.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	61	(42 - 110)
Terphenyl-d14	76	(37 - 137)
2-Fluorobiphenyl	69	(43 - 110)
2-Fluorophenol	68	(11 - 116)
Phenol-d5	65	(25 - 115)
2,4,6-Tribromophenol	73	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-007	**Work Order #...:**	L73VP1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	06:51		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	75	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	56	(42 - 110)
Terphenyl-d14	56	(37 - 137)
2-Fluorobiphenyl	59	(43 - 110)
2-Fluorophenol	60	(11 - 116)
Phenol-d5	57	(25 - 115)
2,4,6-Tribromophenol	61	(35 - 116)

MW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-C

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-008	**Work Order #...:**	L73VQ1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	07:11		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	74	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	**6.3 J**	**16**	**ug/kg**	**2.5**
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	80	(42 - 110)
Terphenyl-d14	89	(37 - 137)
2-Fluorobiphenyl	86	(43 - 110)
2-Fluorophenol	83	(11 - 116)
Phenol-d5	80	(25 - 115)
2,4,6-Tribromophenol	98	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

RW
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-009	**Work Order #...:**	L73VR1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	07:31		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	74	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	65	(42 - 110)
Terphenyl-d14	57	(37 - 137)
2-Fluorobiphenyl	66	(43 - 110)
2-Fluorophenol	65	(11 - 116)
Phenol-d5	63	(25 - 115)
2,4,6-Tribromophenol	72	(35 - 116)

hw
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EA Engineering, Science and Technology

Client Sample ID: PR-MOAM-FT-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-010	**Work Order #...:**	L73VT1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	07:50		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	44	(42 - 110)
Terphenyl-d14	46	(37 - 137)
2-Fluorobiphenyl	47	(43 - 110)
2-Fluorophenol	40	(11 - 116)
Phenol-d5	39	(25 - 115)
2,4,6-Tribromophenol	49	(35 - 116)

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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-011	**Work Order #...:**	L73VV1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	08:48		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	71	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	**11 J**	**16**	**ug/kg**	**1.5**
Acenaphthylene	**9.0 J**	**16**	**ug/kg**	**1.8**
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**59**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	**19**	**16**	**ug/kg**	**1.4**
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	**5.4 ~~J~~ J**	**16**	**ug/kg**	**1.6**
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(42 - 110)
Terphenyl-d14	18 *	(37 - 137)
2-Fluorobiphenyl	66	(43 - 110)
2-Fluorophenol	66	(11 - 116)
Phenol-d5	69	(25 - 115)
2,4,6-Tribromophenol	66	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-012	**Work Order #...:**	L73VX1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	09:08		
Dilution Factor:	1.2	**Initial Wgt/Vol:**	25.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	73	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	8.0	ug/kg	0.80
Acenaphthene	**6.4 J**	**8.0**	**ug/kg**	**0.77**
Acenaphthylene	**6.6 J**	**8.0**	**ug/kg**	**0.92**
Anthracene	ND	8.0	ug/kg	0.78
Benzo(a)anthracene	ND	8.0	ug/kg	1.0
Benzo(b)fluoranthene	ND	8.0	ug/kg	1.3
Benzo(k)fluoranthene	ND	8.0	ug/kg	1.6
Benzo(ghi)perylene	ND	8.0	ug/kg	0.80
Chrysene	ND	8.0	ug/kg	0.95
Dibenz(a,h)anthracene	ND	8.0	ug/kg	0.89
Fluoranthene	**34**	**8.0**	**ug/kg**	**0.86**
Fluorene	ND	8.0	ug/kg	1.1
Indeno(1,2,3-cd)pyrene	ND	8.0	ug/kg	0.82
Naphthalene	ND	8.0	ug/kg	0.69
Phenanthrene	ND	8.0	ug/kg	1.3
Pyrene	ND	8.0	ug/kg	0.81
2-Methylnaphthalene	ND	8.0	ug/kg	0.72
1-Methylnaphthalene	ND	8.0	ug/kg	0.85

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	46	(42 - 110)
Terphenyl-d14	31 *	(37 - 137)
2-Fluorobiphenyl	51	(43 - 110)
2-Fluorophenol	49	(11 - 116)
Phenol-d5	53	(25 - 115)
2,4,6-Tribromophenol	51	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-C

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-013	**Work Order #...:**	L73V01AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	09:27		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	72	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	**4.5 J**	**16**	**ug/kg**	**1.8**
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	52	(42 - 110)
Terphenyl-d14	34 *	(37 - 137)
2-Fluorobiphenyl	58	(43 - 110)
2-Fluorophenol	59	(11 - 116)
Phenol-d5	65	(25 - 115)
2,4,6-Tribromophenol	63	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-014	**Work Order #...:**	L73V21AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	09:47		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	73	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	**7.6 J**	**16**	**ug/kg**	**1.5**
Acenaphthylene	**8.6 J**	**16**	**ug/kg**	**1.8**
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**34**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	77	(42 - 110)
Terphenyl-d14	53	(37 - 137)
2-Fluorobiphenyl	80	(43 - 110)
2-Fluorophenol	77	(11 - 116)
Phenol-d5	85	(25 - 115)
2,4,6-Tribromophenol	87	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

LW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-WB-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-015	**Work Order #...:**	L73V31AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	10:06		
Dilution Factor:	1.2	**Initial Wgt/Vol:**	25.1 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	73	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	8.0	ug/kg	0.80
Acenaphthene	**6.2 J**	**8.0**	**ug/kg**	**0.77**
Acenaphthylene	**6.7 J**	**8.0**	**ug/kg**	**0.92**
Anthracene	ND	8.0	ug/kg	0.78
Benzo(a)anthracene	ND	8.0	ug/kg	1.0
Benzo(b)fluoranthene	ND	8.0	ug/kg	1.3
Benzo(k)fluoranthene	ND	8.0	ug/kg	1.6
Benzo(ghi)perylene	**0.84 ~~J~~ J**	**8.0**	**ug/kg**	**0.80**
Chrysene	ND	8.0	ug/kg	0.95
Dibenz(a,h)anthracene	ND	8.0	ug/kg	0.89
Fluoranthene	**34**	**8.0**	**ug/kg**	**0.86**
Fluorene	**7.2 J**	**8.0**	**ug/kg**	**1.1**
Indeno(1,2,3-cd)pyrene	**3.2 ~~J~~ J**	**8.0**	**ug/kg**	**0.82**
Naphthalene	**19**	**8.0**	**ug/kg**	**0.69**
Phenanthrene	**10**	**8.0**	**ug/kg**	**1.3**
Pyrene	ND	8.0	ug/kg	0.81
2-Methylnaphthalene	**5.0 J**	**8.0**	**ug/kg**	**0.72**
1-Methylnaphthalene	ND	8.0	ug/kg	0.85

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	67	(42 - 110)
Terphenyl-d14	35 *	(37 - 137)
2-Fluorobiphenyl	70	(43 - 110)
2-Fluorophenol	73	(11 - 116)
Phenol-d5	77	(25 - 115)
2,4,6-Tribromophenol	73	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-A

GC/MS Semivolatiles

Lot-Sample #...: C0J060555-016 **Work Order #...:** L73V41AH **Matrix.....:** BIOLOGIC
Date Sampled...: 10/01/10 **Date Received..:** 10/06/10 **MS Run #.....:** 0313027
Prep Date.....: 11/09/10 **Analysis Date..:** 11/15/10
Prep Batch #...: 0313047 **Analysis Time..:** 10:26
Dilution Factor: 4 **Initial Wgt/Vol:** 15 g **Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 78 **Analyst ID.....:** 007062 **Instrument ID..:** 722
Method.....: SW846 8270C

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	27	ug/kg	2.7
Acenaphthene	ND	27	ug/kg	2.6
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	ND	27	ug/kg	2.3
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	68	(42 - 110)
Terphenyl-d14	72	(37 - 137)
2-Fluorobiphenyl	75	(43 - 110)
2-Fluorophenol	69	(11 - 116)
Phenol-d5	68	(25 - 115)
2,4,6-Tribromophenol	79	(35 - 116)

NW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-017	**Work Order #...:**	L73V51AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	10:45		
Dilution Factor:	3	**Initial Wgt/Vol:**	20 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	77	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	20	ug/kg	2.0
Acenaphthene	**3.6 J**	**20**	**ug/kg**	**1.9**
Acenaphthylene	ND	20	ug/kg	2.3
Anthracene	ND	20	ug/kg	2.0
Benzo(a)anthracene	ND	20	ug/kg	2.5
Benzo(b)fluoranthene	ND	20	ug/kg	3.1
Benzo(k)fluoranthene	ND	20	ug/kg	4.0
Benzo(ghi)perylene	ND	20	ug/kg	2.0
Chrysene	ND	20	ug/kg	2.4
Dibenz(a,h)anthracene	ND	20	ug/kg	2.2
Fluoranthene	ND	20	ug/kg	2.1
Fluorene	ND	20	ug/kg	2.6
Indeno(1,2,3-cd)pyrene	ND	20	ug/kg	2.1
Naphthalene	**13 J**	**20**	**ug/kg**	**1.7**
Phenanthrene	**5.8 J**	**20**	**ug/kg**	**3.2**
Pyrene	ND	20	ug/kg	2.0
2-Methylnaphthalene	ND	20	ug/kg	1.8
1-Methylnaphthalene	ND	20	ug/kg	2.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	51	(42 - 110)
Terphenyl-d14	52	(37 - 137)
2-Fluorobiphenyl	53	(43 - 110)
2-Fluorophenol	49	(11 - 116)
Phenol-d5	47	(25 - 115)
2,4,6-Tribromophenol	58	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

MW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-C

GC/MS Semivolatiles

Lot-Sample #...: C0J060555-018
Date Sampled...: 10/01/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313047
Dilution Factor: 2.38
% Moisture.....: 76

Work Order #...: L73V61AH
Date Received..: 10/06/10
Analysis Date..: 11/15/10
Analysis Time..: 11:05
Initial Wgt/Vol: 25.2 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313027

Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	45	(42 - 110)
Terphenyl-d14	48	(37 - 137)
2-Fluorobiphenyl	50	(43 - 110)
2-Fluorophenol	42	(11 - 116)
Phenol-d5	38	(25 - 115)
2,4,6-Tribromophenol	51	(35 - 116)

MW
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EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-019	**Work Order #...:**	L73V71AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	11:24		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	78	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	**4.1 J**	**16**	**ug/kg**	**1.4**
Phenanthrene	**4.3 J**	**16**	**ug/kg**	**2.5**
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	61	(42 - 110)
Terphenyl-d14	61	(37 - 137)
2-Fluorobiphenyl	66	(43 - 110)
2-Fluorophenol	56	(11 - 116)
Phenol-d5	54	(25 - 115)
2,4,6-Tribromophenol	71	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

KW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: CP-MOAM-FT-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-020	**Work Order #...:**	L73V81AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/18/10		
Prep Batch #...:	0313047	**Analysis Time..:**	00:26		
Dilution Factor:	2.38	**Initial Wgt/Vol:**	25.2 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzo(a)pyrene	ND	16	ug/kg	1.6
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**14 J**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	68	(42 - 110)
Terphenyl-d14	27 *	(37 - 137)
2-Fluorobiphenyl	65	(43 - 110)
2-Fluorophenol	71	(11 - 116)
Phenol-d5	73	(25 - 115)
2,4,6-Tribromophenol	71	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/8/10

EA Engineering, Science and Technology

Client Sample ID: SRM 1

GC/MS Semivolatiles

Lot-Sample #...:	C0J060555-021	**Work Order #...:**	L733E1AA	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/01/10	**Date Received..:**	10/06/10	**MS Run #.....:**	0313027
Prep Date.....:	11/09/10	**Analysis Date..:**	11/15/10		
Prep Batch #...:	0313047	**Analysis Time..:**	12:44		
Dilution Factor:	12	**Initial Wgt/Vol:**	5 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:		**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	80	ug/kg	7.7
Acenaphthylene	ND	80	ug/kg	9.2
Anthracene	ND	80	ug/kg	7.8
Benzo(a)anthracene	**11 ~~J~~ J**	**80**	**ug/kg**	**10**
Benzo(b)fluoranthene	ND	80	ug/kg	13
Benzo(k)fluoranthene	ND	80	ug/kg	16
Benzo(ghi)perylene	ND	80	ug/kg	8.0
Benzo(a)pyrene	**39 ~~J~~ J**	**80**	**ug/kg**	**8.0**
Chrysene	**13 ~~J~~ J**	**80**	**ug/kg**	**9.5**
Dibenz(a,h)anthracene	ND	80	ug/kg	8.9
Fluoranthene	**20 J**	**80**	**ug/kg**	**8.6**
Fluorene	ND	80	ug/kg	11
Indeno(1,2,3-cd)pyrene	ND	80	ug/kg	8.2
Naphthalene	ND	80	ug/kg	6.9
Phenanthrene	**15 J**	**80**	**ug/kg**	**13**
Pyrene	**19 ~~J~~ J**	**80**	**ug/kg**	**8.1**
2-Methylnaphthalene	ND	80	ug/kg	7.2
1-Methylnaphthalene	ND	80	ug/kg	8.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(42 - 110)
Terphenyl-d14	63	(37 - 137)
2-Fluorobiphenyl	69	(43 - 110)
2-Fluorophenol	63	(11 - 116)
Phenol-d5	53	(25 - 115)
2,4,6-Tribromophenol	61	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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TestAmerica Laboratories, Inc.

ANALYTICAL REPORT

PROJECT NO. MES SPARROWS PT

MES/EA Sparrows Point

Lot #: C0J090480

Karin Olsen

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301 Alpha Drive Pittsburgh, PA 15238 **tel** 412.963.7058 **fax** 412.963.2468 www.testamericainc.com

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

Certifying State/Program	Certificate #	Program Types	TestAmerica
DoD ELAP	ADE-1442	WW HW	X
US Dept of Agriculture	(#P330-10-00139)	Foreign Soil Import Permit	X
Arkansas	(#88-0690)	WW HW	X X
California – NELAC	04224CA	WW HW	X X
Connecticut	(#PH-0688)	WW HW	X X
Florida – NELAC	(#E871008)	WW HW	X X
Illinois – NELAC	(#002319)	WW HW	X X
Kansas – NELAC	(#E-10350)	WW HW	X X
Louisiana – NELAC	(#04041)	WW HW	X X
New Hampshire – NELAC	(#203010)	WW --	X --
New Jersey – NELAC	(PA-005)	WW HW	X X
New York – NELAC	(#11182)	WW HW	X X
North Carolina	(#434)	WW HW	X X
Pennsylvania - NELAC	(#02-00416)	WW HW	X X
South Carolina	(#89014002)	WW HW	X X
Utah – NELAC	(STLP)	WW HW	X X
West Virginia	(#142)	WW HW	X X
Wisconsin	998027800	WW HW	X X

The codes utilized for program types are described below:

HW Hazardous Waste certification
WW Non-potable Water and/or Wastewater certification
X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pttsburgh_Updated 051910.doc

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J090480

Sample Receiving:
TestAmerica's Pittsburgh laboratory received samples on October 7, and 12, 2010. The coolers were received within the proper temperature range.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Semivolatiles:
Due to the concentration of target compounds detected and/or matrix several samples were analyzed at a dilution.

Several samples had surrogates and/or internal stadarnd area counts not meet criteria. There were insufficiet sample volume for re-extraction. All data was reported "as is".

The SRM was non-detect for all target compounds due to the concentration of the SRM being to low for the instrument to detect.

The matrix spike of sample CP-CASA-MT-E recovered outside of the control limits for naphthalene.

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

Several continuing calibration standards had compounds with a %D >25%; but were within the expected performance range for these compounds.

PCB Congeners:
Due to the concentration of target compounds detected and/or matrix, several samples were analyzed at a dilution.

The matrix spike of sample CP-CASA-MU-E recovered outside of the control limits for PCB 49.

The matrix spike duplicate of sample CP-CASA-MU-E recovered outside of the control limits for PCB 49 and PCB 118.

CASE NARRATIVE
EA Engineering
Sparrows Point

LOT # C0J090480

Metals:
The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

The matrix spike and matrix spike duplicate of sample CP-CASA-MT-E recovered outside of the control limits for tin.

General Chemistry:
There were no problems associated with the analysis.

Brooks Rand LLC performed the arsenic speciation analysis. Their report will follow under separate cover.

METHODS SUMMARY

C0J090480

PARAMETER	ANALYTICAL METHOD	PREPARATION METHOD
ICP-MS (6020)	SW846 6020	SW846 3050B
Mercury in Solid Waste (Manual Cold-Vapor)	SW846 7471A	SW846 7471A
Percent Lipids	SW846 Total Res	
Percent Moisture	SM20 2540G	
PCB Congeners by SW-846 8082	SW846 8082 Cong	
Semivolatile Organics GCMS BNA 8270C	SW846 8270C	

References:

SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0J090480

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
L78R0	001	PR-CASA-MT-A	10/05/10	08:30
L78R1	002	PR-CASA-MT-B	10/05/10	09:49
L78R2	003	PR-CASA-MT-C	10/05/10	10:47
L78R3	004	PR-CASA-MT-D	10/05/10	12:50
L78R4	005	PR-CASA-MT-E	10/05/10	13:55
L78R5	006	PR-CASA-MU-A	10/05/10	08:30
L78R6	007	PR-CASA-MU-B	10/05/10	09:49
L78R7	008	PR-CASA-MU-C	10/05/10	10:47
L78R8	009	PR-CASA-MU-E	10/05/10	13:55
L78R9	010	CP-CASA-MT-A	10/04/10	11:00
L78TA	011	CP-CASA-MT-B	10/04/10	12:00
L78TC	012	CP-CASA-MT-C	10/04/10	13:40
L78TD	013	CP-CASA-MT-D	10/04/10	15:00
L78TE	014	CP-CASA-MT-E	10/04/10	13:00
L78TF	015	CP-CASA-MU-A	10/04/10	11:00
L78TG	016	CP-CASA-MU-B	10/04/10	12:00
L78TH	017	CP-CASA-MU-C	10/04/10	13:40
L78TJ	018	CP-CASA-MU-D	10/04/10	15:00
L78TK	019	CP-CASA-MU-E	10/04/10	14:00
L787N	020	SRM	10/04/10	
L8CAK	021	PR-CASA-MU-D	10/11/10	12:30

NOTE(S):

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Tissue Sampling

Project#: 1453417 0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN:

Date	Time	Water	Tissue	Sample Identification	No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)	Remarks
10/5/2010	0830		X	PR-CASA-MT-A	1	x	x	x	x	x	SEE PROJECT SPECIFIC
10/5/2010	0944		X	PR-CASA-MT-B	1	x	x	x	x	x	ANALYTE LIST
10/5/2010	1047		X	PR-CASA-MT-C	1	x	x	x		x	
10/5/2010	1250		X	PR-CASA-MT-D	1	x	x	x		x	
10/5/2010	1355		X	PR-CASA-MT-E	1	x	x	x		x	
10/5/2010	0830		X	PR-CASA-MU-A	1	x	x	x	x	x	
10/5/2010	0944		X	PR-CASA-MU-B	1	x	x	x	x	x	
10/5/2010	1047		X	PR-CASA-MU-C	1	x	x	x		x	
10/5/2010	1250		X	PR-CASA-MU-D	1	x	x	x		x	
10/5/2010	1355		X	PR-CASA-MU-E	1	x	x	x		x	

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	10/6/10 /1500		
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time
		[signature]	10/9/10 10[illegible]

Patapsco River
Tissue Composite Samples

Client:	Project Manager:
EA Engineering Science, and Technology, Inc.	**Mike Ciarlo**
	Phone: **410-771-4950**
15 Loveton Circle	Field Contact:
Sparks, MD 21152	**Rob Ballentine**
	Phone: **410-627-2731**

Project Name: Coke Point Tissue Sampling

Project#: 1453417 0008

Page 1 of 1

Parameters/Method Numbers for Analysis

Date	Time	Water	Tissue	Sample Identification	No. of Containers	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
10/4/2010	1100		X	CP-CASA-MT-A	1	x	x	x	x	x
10/4/2010	1200		X	CP-CASA-MT-B	1	x	x	x	x	x
10/4/2010	1340		X	CP-CASA-MT-C	1	x	x	x		x
10/4/2010	1500		X	CP-CASA-MT-D	1	x	x	x		x
10/4/2010	1300		X	CP-CASA-MT-E (& MS/MSD)	1	x	x	x		x
10/4/2010	1100		X	CP-CASA-MU-A	1	x	x	x	x	x
10/4/2010	1200		X	CP-CASA-MU-B	1	x	x	x	x	x
10/4/2010	1340		X	CP-CASA-MU-C	1	x	x	x		x
10/4/2010	1500		X	CP-CASA-MU-D	1	x	x	x		x
10/4/2010	1400		X	CP-CASA-MU-E ~~(& MS/MSD)~~	1	x	x	x		x
10/4/10	1300		X	CP-CASA-MU-EMSD	1	X	X	X		X
"	1300		X	CP-CASA-MT-EMSD	1	X	X	X		X

Chain of Custody Record

Laboratory:
TestAmerica - Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238

phone: 412-963-7058

ATTN:

Remarks

SEE PROJECT SPECIFIC ANALYTE LIST

Sampled by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	10/6/10/1500		
Relinquished by: (Signature)	Date/Time	Received by Laboratory: (Signature)	Date/Time
		[signature]	10/7/10 1000

Coke Point
Tissue Composite Samples

ENVIRONMENTAL
Data Services, Inc.

METALS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J090480

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-CASA-MT-A	C0J090480-001	Tissue
2	PR-CASA-MT-B	C0J090480-002	Tissue
3	PR-CASA-MT-C	C0J090480-003	Tissue
4	PR-CASA-MT-D	C0J090480-004	Tissue
5	PR-CASA-MT-E	C0J090480-005	Tissue
6	PR-CASA-MU-A	C0J090480-006	Tissue
7	PR-CASA-MU-B	C0J090480-007	Tissue
8	PR-CASA-MU-C	C0J090480-008	Tissue
9	PR-CASA-MU-E	C0J090480-009	Tissue
10	CP-CASA-MT-A	C0J090480-010	Tissue
11	CP-CASA-MT-B	C0J090480-011	Tissue
12	CP-CASA-MT-C	C0J090480-012	Tissue
13	CP-CASA-MT-D	C0J090480-013	Tissue
14	CP-CASA-MT-E	C0J090480-014	Tissue
14MS	CP-CASA-MT-EMS	C0J090480-014MS	Tissue
14MSD	CP-CASA-MT-EMSD	C0J090480-014MSD	Tissue
15	CP-CASA-MU-A	C0J090480-015	Tissue
16	CP-CASA-MU-B	C0J090480-016	Tissue
17	CP-CASA-MU-C	C0J090480-017	Tissue
18	CP-CASA-MU-D	C0J090480-018	Tissue
19	CP-CASA-MU-E	C0J090480-019	Tissue
19MS	CP-CASA-MU-EMS	C0J090480-019MS	Tissue
19MSD	CP-CASA-MU-EMSD	C0J090480-019MSD	Tissue
20	SRM	C0J090480-020	Tissue
21	PR-CASA-MU-D	C0J090480-021	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 28 days for mercury and 180 days for all other metals.

Calibration - The ICV and CCV %R values were acceptable.

CRDL Standard - The CRDL standards exhibited acceptable %R values.

Method and Calibration Blanks - The method blanks and continuing calibration blanks exhibited the following contamination.

Blank ID	Compound	Conc. mg/kg	Action Level mg/kg	Qualifier	Affected Samples
Batch 0299403	Antimony	0.017	0.085	B	1-14
	Chromium	0.033	0.165	B	1, 3-5, 10, 11, 14
	Copper	0.033	0.165	None	All > 5X
	Iron	1.9	9.5	B	2
	Selenium	0.046	0.23	None	All > 5X
Batch 0299404	Antimony	0.022	0.11	B	15-21
	Arsenic	0.022	0.11	None	All > 5X
	Chromium	0.040	0.20	None	All ND or > 5X
	Copper	0.11	0.55	None	All > 5X
	Iron	1.4	7.0	None	All > 5X
	Selenium	0.091	0.455	None	All > 5X

Field and Equipment Blank - Field QC samples were not included in this data package.

ICP Interference Check Sample - All %R values were acceptable.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
14	Tin	66%/63%/OK	L/UL	1-14

LCS - The LCS samples exhibited acceptable %R values.

ICP Serial Dilution - The ICP serial dilution sample exhibited acceptable %D values.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - All results reported with a (B) qualifier by the laboratory were further qualified as estimated (J) except those results already qualified.

The laboratory used (J) flags to indicate blank contamination which the reviewer deleted since the results were not affected.

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-A

TOTAL Metals

Lot-Sample #...: C0J090480-001 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	2.8 ~~B~~ J	2.9	mg/kg	SW846 6020	10/26-11/02/10	L78R01AD
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.23	
Antimony	0.040 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78R01AE
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0032	
Arsenic	0.94	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AF
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.016	
Beryllium	ND	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AG
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0036	
Cadmium	0.070 ~~B~~ J	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AH
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0087	
Chromium	0.018 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78R01AJ
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0077	
Cobalt	0.032 ~~B~~ J	0.048	mg/kg	SW846 6020	10/26-11/02/10	L78R01AK
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0024	
Copper	11.3 ~~J~~	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78R01AL
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0082	
Iron	14.1 ~~J~~	4.8	mg/kg	SW846 6020	10/26-11/02/10	L78R01AM
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.28	

(Continued on next page)

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-A

TOTAL Metals

Lot-Sample #...: C0J090480-001 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.029 ~~B~~ J	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AN
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0033	
Manganese	3.1	0.048	mg/kg	SW846 6020	10/26-11/02/10	L78R01AP
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.014	
Nickel	0.080 ~~B~~ J	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AQ
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0065	
Selenium	1.0 ~~J~~	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78R01AR
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.039	
Silver	0.27	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AT
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Thallium	0.0082 ~~B~~ J	0.096	mg/kg	SW846 6020	10/26-11/02/10	L78R01AU
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0019	
Tin	0.30 ~~B~~ L	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78R01AV
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.10	
Zinc	40.4	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78R01AW
		Dilution Factor: 0.96		Analysis Time..: 18:55	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	
Prep Batch #...: 0305010						
Mercury	0.030 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/01/10	L78R01A1
		Dilution Factor: 1		Analysis Time..: 08:44	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-B

TOTAL Metals

Lot-Sample #...: C0J090480-002 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/05/10 **Date Received..:** 10/07/10
% Moisture.....: 80

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	**1.8 ~~B~~ J**	**2.0**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AK**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.16	
Antimony	**0.013 ~~B,J~~ B**	**0.14**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AL**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Arsenic	**0.87**	**0.068**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AM**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	
Beryllium	ND	0.068	mg/kg	SW846 6020	10/26-11/02/10	L78R11AN
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0025	
Cadmium	**0.052 ~~B~~ J**	**0.068**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AP**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0062	
Chromium	ND	0.14	mg/kg	SW846 6020	10/26-11/02/10	L78R11AQ
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0054	
Cobalt	**0.019 ~~B~~ J**	**0.034**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AR**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0017	
Copper	**7.9 ~~B~~**	**0.14**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AT**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0058	
Iron	**8.0 ~~B~~ B**	**3.4**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R11AU**
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.20	

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-B

TOTAL Metals

Lot-Sample #...: C0J090480-002 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.017 ~~B~~ J	0.068	mg/kg	SW846 6020	10/26-11/02/10	L78R11AV
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Manganese	2.5	0.034	mg/kg	SW846 6020	10/26-11/02/10	L78R11AW
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0099	
Nickel	0.058 ~~B~~ J	0.068	mg/kg	SW846 6020	10/26-11/02/10	L78R11AX
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0046	
Selenium	0.98 ~~B~~	0.34	mg/kg	SW846 6020	10/26-11/02/10	L78R11A0
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.028	
Silver	0.17	0.068	mg/kg	SW846 6020	10/26-11/02/10	L78R11A1
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0016	
Thallium	ND	0.068	mg/kg	SW846 6020	10/26-11/02/10	L78R11A2
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0014	
Tin	~~ND~~ UL	0.34	mg/kg	SW846 6020	10/26-11/02/10	L78R11A3
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.072	
Zinc	35.4	0.34	mg/kg	SW846 6020	10/26-11/02/10	L78R11A4
		Dilution Factor: 0.68		Analysis Time..: 19:00	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0080	

Prep Batch #...: 0305010

Mercury	0.018 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/01/10	L78R11AC
		Dilution Factor: 1		Analysis Time..: 08:46	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-C

TOTAL Metals

Lot-Sample #...: C0J090480-003 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.1	2.5	mg/kg	SW846 6020	10/26-11/02/10	L78R21AK
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.20	
Antimony	0.016 ~~B,J~~ B	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R21AL
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0027	
Arsenic	0.83	0.083	mg/kg	SW846 6020	10/26-11/02/10	L78R21AM
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.014	
Beryllium	ND	0.083	mg/kg	SW846 6020	10/26-11/02/10	L78R21AN
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Cadmium	0.032 ~~B~~ J	0.083	mg/kg	SW846 6020	10/26-11/02/10	L78R21AP
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0076	
Chromium	0.055 ~~B,J~~ B	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R21AQ
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0066	
Cobalt	0.027 ~~B~~ J	0.042	mg/kg	SW846 6020	10/26-11/02/10	L78R21AR
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0021	
Copper	8.5 ~~J~~	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R21AT
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0071	
Iron	12.3 ~~J~~	4.2	mg/kg	SW846 6020	10/26-11/02/10	L78R21AU
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.24	

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Client Sample ID: PR-CASA-MT-C

TOTAL Metals

Lot-Sample #...: C0J090480-003 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.032 ~~B~~ J**	**0.083**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21AV**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0028	
Manganese	**3.2**	**0.042**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21AW**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.012	
Nickel	**0.064 ~~B~~ J**	**0.083**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21AX**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0056	
Selenium	**0.84 ~~J~~**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21A0**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.034	
Silver	**0.11**	**0.083**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21A1**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0020	
Thallium	ND	0.083	mg/kg	SW846 6020	10/26-11/02/10	L78R21A2
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0017	
Tin	~~ND~~ UL	0.42	mg/kg	SW846 6020	10/26-11/02/10	L78R21A3
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.088	
Zinc	**46.2**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R21A4**
		Dilution Factor: 0.83		Analysis Time..: 19:04	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0097	

Prep Batch #...: 0305010

Mercury	**0.017 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78R21AC**
		Dilution Factor: 1		Analysis Time..: 08:47	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-D

TOTAL Metals

Lot-Sample #...: C0J090480-004 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	**2.9**	**2.7**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AK**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.21	
Antimony	**0.014 ~~B,J~~ B**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AL**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0030	
Arsenic	**0.95**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AM**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R31AN
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0033	
Cadmium	**0.028 ~~B~~ J**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AP**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0082	
Chromium	**0.025 ~~B,J~~ B**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AQ**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0072	
Cobalt	**0.026 ~~B~~ J**	**0.045**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AR**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Copper	**8.8 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AT**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0076	
Iron	**14.3 ~~J~~**	**4.5**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R31AU**
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-D

TOTAL Metals

Lot-Sample #...: C0J090480-004 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.023 ~~B~~ J	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R31AV
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Manganese	1.9	0.045	mg/kg	SW846 6020	10/26-11/02/10	L78R31AW
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	0.041 ~~B~~ J	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R31AX
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0061	
Selenium	0.85 ~~J~~	0.45	mg/kg	SW846 6020	10/26-11/02/10	L78R31A0
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.037	
Silver	0.17	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R31A1
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Thallium	ND	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R31A2
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Tin	0.11 ~~B~~ L	0.45	mg/kg	SW846 6020	10/26-11/02/10	L78R31A3
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.095	
Zinc	46.0	0.45	mg/kg	SW846 6020	10/26-11/02/10	L78R31A4
		Dilution Factor: 0.9		Analysis Time..: 19:08	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	

Prep Batch #...: 0305010

Mercury	0.016 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/01/10	L78R31AC
		Dilution Factor: 1		Analysis Time..: 08:49	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-E

TOTAL Metals

Lot-Sample #...: C0J090480-005 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/05/10 **Date Received..:** 10/07/10
% Moisture.....: 78

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	**3.6**	**2.7**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AK**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.21	
Antimony	**0.013 ~~B,J~~ B**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AL**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0030	
Arsenic	**0.94**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AM**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R41AN
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0033	
Cadmium	**0.0092 ~~B~~ J**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AP**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0082	
Chromium	**0.031 ~~B,J~~ B**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AQ**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0072	
Cobalt	**0.036 ~~B~~ J**	**0.045**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AR**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Copper	**9.4 ~~J~~**	**0.18**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AT**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0076	
Iron	**15.7 ~~J~~**	**4.5**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AU**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.26	

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Client Sample ID: PR-CASA-MT-E

TOTAL Metals

Lot-Sample #...: C0J090480-005 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.034 ~~B~~ J**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AV**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Manganese	**2.8**	**0.045**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AW**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	**0.064 ~~B~~ J**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41AX**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0061	
Selenium	**0.87 J**	**0.45**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41A0**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.037	
Silver	**0.12**	**0.090**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41A1**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Thallium	ND	0.090	mg/kg	SW846 6020	10/26-11/02/10	L78R41A2
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Tin	~~ND~~ UL	0.45	mg/kg	SW846 6020	10/26-11/02/10	L78R41A3
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.095	
Zinc	**41.8**	**0.45**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R41A4**
		Dilution Factor: 0.9		Analysis Time..: 19:13	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	

Prep Batch #...: 0305010

Mercury	**0.015 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78R41AC**
		Dilution Factor: 1		Analysis Time..: 08:51	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: PR-CASA-MU-A

TOTAL Metals

Lot-Sample #...: C0J090480-006 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 79

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.9	2.2	mg/kg	SW846 6020	10/26-11/02/10	L78R51AK
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.17	
Antimony	0.024 ~~B,J~~ B	0.15	mg/kg	SW846 6020	10/26-11/02/10	L78R51AL
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0024	
Arsenic	1.7	0.074	mg/kg	SW846 6020	10/26-11/02/10	L78R51AM
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.012	
Beryllium	ND	0.074	mg/kg	SW846 6020	10/26-11/02/10	L78R51AN
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0027	
Cadmium	0.56	0.074	mg/kg	SW846 6020	10/26-11/02/10	L78R51AP
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0067	
Chromium	0.27 J	0.15	mg/kg	SW846 6020	10/26-11/02/10	L78R51AQ
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0059	
Cobalt	0.22	0.037	mg/kg	SW846 6020	10/26-11/02/10	L78R51AR
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Copper	22.9 J	0.15	mg/kg	SW846 6020	10/26-11/02/10	L78R51AT
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0063	
Iron	32.2 J	3.7	mg/kg	SW846 6020	10/26-11/02/10	L78R51AU
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.21	

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Client Sample ID: PR-CASA-MU-A

TOTAL Metals

Lot-Sample #...: C0J090480-006 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.078**	**0.074**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51AV**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0025	
Manganese	**18.6**	**0.037**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51AW**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	
Nickel	**0.43**	**0.074**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51AX**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0050	
Selenium	**1.1** ~~J~~	**0.37**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51A0**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.030	
Silver	**0.64**	**0.074**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51A1**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Thallium	**0.0099** ~~B~~ J	**0.074**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51A2**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0015	
Tin	**0.13** ~~B~~ L	**0.37**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51A3**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.078	
Zinc	**22.2**	**0.37**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R51A4**
		Dilution Factor: 0.74		Analysis Time..: 19:17	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0087	

Prep Batch #...: 0305010

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78R51AC
		Dilution Factor: 1		Analysis Time..: 08:52	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: PR-CASA-MU-B

TOTAL Metals

Lot-Sample #...: C0J090480-007 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 83

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.0	2.6	mg/kg	SW846 6020	10/26-11/02/10	L78R61AK
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.20	
Antimony	0.015 ~~B,J~~ B	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R61AL
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0028	
Arsenic	2.1	0.085	mg/kg	SW846 6020	10/26-11/02/10	L78R61AM
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.014	
Beryllium	ND	0.085	mg/kg	SW846 6020	10/26-11/02/10	L78R61AN
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Cadmium	0.88	0.085	mg/kg	SW846 6020	10/26-11/02/10	L78R61AP
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0077	
Chromium	0.35 J	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R61AQ
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0068	
Cobalt	0.21	0.042	mg/kg	SW846 6020	10/26-11/02/10	L78R61AR
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0021	
Copper	37.8 J	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78R61AT
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0072	
Iron	22.7 J	4.2	mg/kg	SW846 6020	10/26-11/02/10	L78R61AU
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.25	

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Client Sample ID: PR-CASA-MU-B

TOTAL Metals

Lot-Sample #...: C0J090480-007 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.074 ~~B~~ J**	**0.085**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61AV**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0029	
Manganese	**7.6**	**0.042**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61AW**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.012	
Nickel	**0.64**	**0.085**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61AX**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0058	
Selenium	**1.4 ~~B~~**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61A0**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.035	
Silver	**0.80**	**0.085**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61A1**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0020	
Thallium	ND	0.085	mg/kg	SW846 6020	10/26-11/02/10	L78R61A2
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0017	
Tin	**0.15 ~~B~~ L**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61A3**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.090	
Zinc	**20.6**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R61A4**
		Dilution Factor: 0.85		Analysis Time..: 19:21	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0099	

Prep Batch #...: 0305010

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78R61AC
		Dilution Factor: 1		Analysis Time..: 08:54	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-C

TOTAL Metals

Lot-Sample #...: C0J090480-008 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 75

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.2	2.4	mg/kg	SW846 6020	10/26-11/02/10	L78R71AK
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.19	
Antimony	0.036 ~~B,J~~ B	0.16	mg/kg	SW846 6020	10/26-11/02/10	L78R71AL
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0026	
Arsenic	2.6	0.079	mg/kg	SW846 6020	10/26-11/02/10	L78R71AM
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Beryllium	ND	0.079	mg/kg	SW846 6020	10/26-11/02/10	L78R71AN
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0029	
Cadmium	0.42	0.079	mg/kg	SW846 6020	10/26-11/02/10	L78R71AP
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0072	
Chromium	0.43 J	0.16	mg/kg	SW846 6020	10/26-11/02/10	L78R71AQ
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0063	
Cobalt	0.60	0.040	mg/kg	SW846 6020	10/26-11/02/10	L78R71AR
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0020	
Copper	21.4 J	0.16	mg/kg	SW846 6020	10/26-11/02/10	L78R71AT
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0067	
Iron	44.8 J	4.0	mg/kg	SW846 6020	10/26-11/02/10	L78R71AU
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.23	

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Client Sample ID: PR-CASA-MU-C

TOTAL Metals

Lot-Sample #...: C0J090480-008 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.069 ~~B~~ J**	**0.079**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71AV**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0027	
Manganese	**8.3**	**0.040**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71AW**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	
Nickel	**0.88**	**0.079**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71AX**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0054	
Selenium	**1.6 J**	**0.40**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71A0**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.032	
Silver	**0.29**	**0.079**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71A1**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0019	
Thallium	ND	0.079	mg/kg	SW846 6020	10/26-11/02/10	L78R71A2
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0016	
Tin	~~ND~~ UL	0.40	mg/kg	SW846 6020	10/26-11/02/10	L78R71A3
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.084	
Zinc	**53.8**	**0.40**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R71A4**
		Dilution Factor: 0.79		Analysis Time..: 19:25	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0092	

Prep Batch #...: 0305010

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78R71AC
		Dilution Factor: 1		Analysis Time..: 08:56	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-E

TOTAL Metals

Lot-Sample #...: C0J090480-009 Matrix.....: BIOLOGIC
Date Sampled...: 10/05/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.5	1.9	mg/kg	SW846 6020	10/26-11/02/10	L78R81AQ
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.15	
Antimony	0.083 ~~B,J~~ B	0.12	mg/kg	SW846 6020	10/26-11/02/10	L78R81AR
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0020	
Arsenic	2.6	0.062	mg/kg	SW846 6020	10/26-11/02/10	L78R81AT
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.010	
Beryllium	ND	0.062	mg/kg	SW846 6020	10/26-11/02/10	L78R81AU
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Cadmium	0.25	0.062	mg/kg	SW846 6020	10/26-11/02/10	L78R81AV
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0056	
Chromium	0.26 J	0.12	mg/kg	SW846 6020	10/26-11/02/10	L78R81AW
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0050	
Cobalt	0.40	0.031	mg/kg	SW846 6020	10/26-11/02/10	L78R81AX
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0016	
Copper	20.1 J	0.12	mg/kg	SW846 6020	10/26-11/02/10	L78R81A0
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0053	
Iron	29.5 J	3.1	mg/kg	SW846 6020	10/26-11/02/10	L78R81A1
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.18	

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Client Sample ID: PR-CASA-MU-E

TOTAL Metals

Lot-Sample #...: C0J090480-009 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.056 ~~B~~ J**	**0.062**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81A2**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0021	
Manganese	**6.6**	**0.031**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81A3**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0090	
Nickel	**0.72**	**0.062**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81A4**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0042	
Selenium	**1.7 J**	**0.31**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81AA**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.025	
Silver	**0.27**	**0.062**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81AC**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0015	
Thallium	ND	0.062	mg/kg	SW846 6020	10/26-11/02/10	L78R81AD
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0012	
Tin	~~ND~~ UL	0.31	mg/kg	SW846 6020	10/26-11/02/10	L78R81AE
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.066	
Zinc	**41.5**	**0.31**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R81AF**
		Dilution Factor: 0.62		Analysis Time..: 19:44	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0073	

Prep Batch #...: 0305010

Mercury	**0.012 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78R81AJ**
		Dilution Factor: 1		Analysis Time..: 09:01	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-A

TOTAL Metals

Lot-Sample #...: C0J090480-010 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/04/10 **Date Received..:** 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.1	2.7	mg/kg	SW846 6020	10/26-11/02/10	L78R91AK
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.21	
Antimony	0.027 ~~B,J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78R91AL
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0030	
Arsenic	0.76	0.091	mg/kg	SW846 6020	10/26-11/02/10	L78R91AM
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.091	mg/kg	SW846 6020	10/26-11/02/10	L78R91AN
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0034	
Cadmium	0.022 ~~B~~ J	0.091	mg/kg	SW846 6020	10/26-11/02/10	L78R91AP
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0083	
Chromium	0.055 ~~B,J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78R91AQ
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0073	
Cobalt	0.044 ~~B~~ J	0.046	mg/kg	SW846 6020	10/26-11/02/10	L78R91AR
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Copper	3.6 ~~J~~	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78R91AT
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0077	
Iron	21.1 ~~J~~	4.6	mg/kg	SW846 6020	10/26-11/02/10	L78R91AU
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-A

TOTAL Metals

Lot-Sample #...: C0J090480-010 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.056 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91AV**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Manganese	**1.8**	**0.046**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91AW**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	**0.072 ~~B~~ J**	**0.091**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91AX**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0062	
Selenium	**0.78 ~~J~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91A0**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.037	
Silver	**0.11**	**0.091**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91A1**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Thallium	ND	0.091	mg/kg	SW846 6020	10/26-11/02/10	L78R91A2
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Tin	~~ND~~ UL	0.46	mg/kg	SW846 6020	10/26-11/02/10	L78R91A3
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.096	
Zinc	**40.6**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78R91A4**
		Dilution Factor: 0.91		Analysis Time..: 19:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	

Prep Batch #...: 0305010

Mercury	**0.013 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78R91AC**
		Dilution Factor: 1		Analysis Time..: 09:03	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-B

TOTAL Metals

Lot-Sample #...: C0J090480-011 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	2.4 ~~B~~ J	2.8	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AK
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.22	
Antimony	0.019 ~~B,J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AL
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0030	
Arsenic	0.84	0.092	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AM
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.092	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AN
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0034	
Cadmium	0.034 ~~B~~ J	0.092	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AP
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0084	
Chromium	0.049 ~~B,J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AQ
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0074	
Cobalt	0.060	0.046	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AR
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Copper	4.3 ~~J~~	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AT
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0078	
Iron	16.9 ~~J~~	4.6	mg/kg	SW846 6020	10/26-11/02/10	L78TA1AU
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.27	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-B

TOTAL Metals

Lot-Sample #...: C0J090480-011 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.047 ~~B~~ J**	**0.092**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1AV**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Manganese	**4.4**	**0.046**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1AW**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	**0.094**	**0.092**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1AX**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0063	
Selenium	**0.80 ~~B~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1A0**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.037	
Silver	**0.12**	**0.092**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1A1**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Thallium	ND	0.092	mg/kg	SW846 6020	10/26-11/02/10	L78TA1A2
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Tin	~~ND~~ UL	0.46	mg/kg	SW846 6020	10/26-11/02/10	L78TA1A3
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.098	
Zinc	**35.8**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TA1A4**
		Dilution Factor: 0.92		Analysis Time..: 19:53	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	

Prep Batch #...: 0305010

Mercury	**0.014 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78TA1AC**
		Dilution Factor: 1		Analysis Time..: 09:04	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-C

TOTAL Metals

Lot-Sample #...: C0J090480-012 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/04/10 **Date Received..:** 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.6	2.7	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AQ
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.21	
Antimony	0.015 ~~B,J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AR
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0029	
Arsenic	1.0	0.089	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AT
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.089	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AU
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0033	
Cadmium	0.040 ~~B~~ J	0.089	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AV
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0081	
Chromium	ND	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AW
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0071	
Cobalt	0.035 ~~B~~ J	0.044	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AX
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Copper	5.5 J	0.18	mg/kg	SW846 6020	10/26-11/02/10	L78TC1A0
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0076	
Iron	29.7 J	4.4	mg/kg	SW846 6020	10/26-11/02/10	L78TC1A1
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-C

TOTAL Metals

Lot-Sample #...: C0J090480-012 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.067 ~~B~~ J**	**0.089**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1A2**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0030	
Manganese	**2.7**	**0.044**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1A3**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	**0.063 ~~B~~ J**	**0.089**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1A4**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0061	
Selenium	**1.0 ~~J~~**	**0.44**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1AA**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.036	
Silver	**0.21**	**0.089**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1AC**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0021	
Thallium	ND	0.089	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AD
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Tin	~~ND~~ UL	0.44	mg/kg	SW846 6020	10/26-11/02/10	L78TC1AE
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.094	
Zinc	**44.1**	**0.44**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TC1AF**
		Dilution Factor: 0.89		Analysis Time..: 19:57	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.010	

Prep Batch #...: 0305010

Mercury	**0.022 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78TC1AJ**
		Dilution Factor: 1		Analysis Time..: 09:06	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-D

TOTAL Metals

Lot-Sample #...: C0J090480-013 **Matrix.....:** BIOLOGIC
Date Sampled...: 10/04/10 **Date Received..:** 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	**3.5**	**2.3**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AQ**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.18	
Antimony	**0.013** ~~B,J~~ B	**0.15**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AR**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0025	
Arsenic	**0.84**	**0.076**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AT**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Beryllium	ND	0.076	mg/kg	SW846 6020	10/26-11/02/10	L78TD1AU
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0028	
Cadmium	**0.033** ~~B~~ J	**0.076**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AV**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0069	
Chromium	ND	0.15	mg/kg	SW846 6020	10/26-11/02/10	L78TD1AW
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0061	
Cobalt	**0.050**	**0.038**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AX**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0019	
Copper	**3.8** ~~J~~	**0.15**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1A0**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0065	
Iron	**20.6** ~~J~~	**3.8**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1A1**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.22	

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Client Sample ID: CP-CASA-MT-D

TOTAL Metals

Lot-Sample #...: C0J090480-013 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.068 ~~B~~ J**	**0.076**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1A2**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0026	
Manganese	**10.4**	**0.038**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1A3**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	
Nickel	**0.081**	**0.076**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1A4**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0052	
Selenium	**0.77 ~~B~~**	**0.38**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AA**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.031	
Silver	**0.14**	**0.076**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AC**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0018	
Thallium	ND	0.076	mg/kg	SW846 6020	10/26-11/02/10	L78TD1AD
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0015	
Tin	~~ND~~ UL	0.38	mg/kg	SW846 6020	10/26-11/02/10	L78TD1AE
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.081	
Zinc	**39.6**	**0.38**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TD1AF**
		Dilution Factor: 0.76		Analysis Time..: 20:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0089	

Prep Batch #...: 0305010

Mercury	**0.014 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78TD1AJ**
		Dilution Factor: 1		Analysis Time..: 09:08	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-E

TOTAL Metals

Lot-Sample #...: C0J090480-014 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299403						
Aluminum	3.2	2.8	mg/kg	SW846 6020	10/26-11/02/10	L78TE1C0
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.22	
Antimony	0.014 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TE1C3
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0031	
Arsenic	0.91	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TE1C6
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TE1C9
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0034	
Cadmium	0.050 ~~B~~ J	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TE1DD
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0085	
Chromium	0.056 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TE1DG
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0074	
Cobalt	0.043 ~~B~~ J	0.046	mg/kg	SW846 6020	10/26-11/02/10	L78TE1DK
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0023	
Copper	5.8 ~~J~~	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TE1DN
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0079	
Iron	23.7 ~~J~~	4.6	mg/kg	SW846 6020	10/26-11/02/10	L78TE1DR
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.27	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-E

TOTAL Metals

Lot-Sample #...: C0J090480-014 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.060 ~~B~~ J**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1DV**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0032	
Manganese	**2.0**	**0.046**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1D0**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.013	
Nickel	**0.095**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1D3**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0063	
Selenium	**0.76 ~~B~~**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1AA**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.038	
Silver	**0.24**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1AE**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0022	
Thallium	ND	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TE1AH
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.0019	
Tin	~~ND~~ UL	0.46	mg/kg	SW846 6020	10/26-11/02/10	L78TE1AL
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.099	
Zinc	**44.3**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TE1AP**
		Dilution Factor: 0.93		Analysis Time..: 20:06	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299236	MDL.....: 0.011	

Prep Batch #...: 0305010

Mercury	**0.017 ~~B~~ J**	**0.033**	**mg/kg**	**SW846 7471A**	**11/01/10**	**L78TE1A1**
		Dilution Factor: 1		Analysis Time..: 09:09	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305002	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-A

TOTAL Metals

Lot-Sample #...: C0J090480-015 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	12.3	2.8	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AK
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.22	
Antimony	0.092 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AL
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0031	
Arsenic	2.3 J	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AM
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.015	
Beryllium	ND	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AN
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0034	
Cadmium	0.51	0.093	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AP
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0085	
Chromium	0.43 J	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AQ
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0074	
Cobalt	0.38	0.046	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AR
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0023	
Copper	15.0 J	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AT
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0079	
Iron	87.6 J	4.6	mg/kg	SW846 6020	10/26-11/02/10	L78TF1AU
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.27	

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Client Sample ID: CP-CASA-MU-A

TOTAL Metals

Lot-Sample #...: C0J090480-015 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.62**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1AV**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0032	
Manganese	**7.4**	**0.046**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1AW**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.013	
Nickel	**0.56**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1AX**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0063	
Selenium	**1.3** ~~B~~	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1A0**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.038	
Silver	**0.38**	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1A1**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0022	
Thallium	**0.0022** ~~B~~ J	**0.093**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1A2**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0019	
Tin	**0.25** ~~B~~ J	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1A3**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.099	
Zinc	**52.7**	**0.46**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TF1A4**
		Dilution Factor: 0.93		Analysis Time..: 20:49	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.011	

Prep Batch #...: 0305011

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78TF1AC
		Dilution Factor: 1		Analysis Time..: 09:22	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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Client Sample ID: CP-CASA-MU-B

TOTAL Metals

Lot-Sample #...: C0J090480-016 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 76

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	9.4	2.5	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AK
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.20	
Antimony	0.072 ~~B,J~~ B	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AL
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0028	
Arsenic	2.1 J	0.084	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AM
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.014	
Beryllium	ND	0.084	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AN
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0031	
Cadmium	0.29	0.084	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AP
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0076	
Chromium	0.36 J	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AQ
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0067	
Cobalt	0.48	0.042	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AR
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0021	
Copper	15.9 J	0.17	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AT
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0071	
Iron	99.5 J	4.2	mg/kg	SW846 6020	10/26-11/02/10	L78TG1AU
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.24	

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Client Sample ID: CP-CASA-MU-B

TOTAL Metals

Lot-Sample #...: C0J090480-016 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.28**	**0.084**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1AV**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0029	
Manganese	**10.9**	**0.042**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1AW**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.012	
Nickel	**0.63**	**0.084**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1AX**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0057	
Selenium	**1.3 ~~B~~**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1A0**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.034	
Silver	**0.39**	**0.084**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1A1**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0020	
Thallium	**0.0023 ~~B~~ J**	**0.084**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1A2**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0017	
Tin	**0.15 ~~B~~ J**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1A3**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.089	
Zinc	**52.9**	**0.42**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TG1A4**
		Dilution Factor: 0.84		Analysis Time..: 20:54	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0098	

Prep Batch #...: 0305011

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78TG1AC
		Dilution Factor: 1		Analysis Time..: 09:23	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-C

TOTAL Metals

Lot-Sample #...: C0J090480-017 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 75

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	8.2	2.9	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AQ
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.23	
Antimony	0.049 ~~B,J~~ B	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AR
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0032	
Arsenic	2.0 ~~J~~	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AT
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.016	
Beryllium	ND	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AU
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0036	
Cadmium	0.63	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AV
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0088	
Chromium	0.27 ~~J~~	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AW
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0078	
Cobalt	0.29	0.048	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AX
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0024	
Copper	24.0 ~~J~~	0.19	mg/kg	SW846 6020	10/26-11/02/10	L78TH1A0
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0082	
Iron	84.4 ~~J~~	4.8	mg/kg	SW846 6020	10/26-11/02/10	L78TH1A1
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.28	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-C

TOTAL Metals

Lot-Sample #...: C0J090480-017 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.32	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1A2
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0033	
Manganese	9.8	0.048	mg/kg	SW846 6020	10/26-11/02/10	L78TH1A3
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.014	
Nickel	0.39	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1A4
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0066	
Selenium	1.4 ~~J~~	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AA
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.039	
Silver	0.76	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AC
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0023	
Thallium	ND	0.097	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AD
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0019	
Tin	0.16 ~~B~~ J	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AE
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.10	
Zinc	41.9	0.48	mg/kg	SW846 6020	10/26-11/02/10	L78TH1AF
		Dilution Factor: 0.97		Analysis Time..: 20:58	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.011	

Prep Batch #...: 0305011

Mercury	0.012 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/01/10	L78TH1AJ
		Dilution Factor: 1		Analysis Time..: 09:25	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-D

TOTAL Metals

Lot-Sample #...: C0J090480-018 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 74

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	**22.9**	**2.4**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AQ**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.19	
Antimony	**0.048 B ~~J~~ B**	**0.16**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AR**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0026	
Arsenic	**2.1 J**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AT**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.013	
Beryllium	ND	0.080	mg/kg	SW846 6020	10/26-11/02/10	L78TJ1AU
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0030	
Cadmium	**0.39**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AV**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0073	
Chromium	**0.33 J**	**0.16**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AW**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0064	
Cobalt	**0.35**	**0.040**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AX**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0020	
Copper	**16.7 J**	**0.16**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1A0**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0068	
Iron	**139 J**	**4.0**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1A1**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.23	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-D

TOTAL Metals

Lot-Sample #...: C0J090480-018 **Matrix.....:** BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.31**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1A2**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0027	
Manganese	**13.2**	**0.040**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1A3**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.012	
Nickel	**0.51**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1A4**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0054	
Selenium	**1.2 ~~J~~**	**0.40**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AA**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.032	
Silver	**0.44**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AC**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0019	
Thallium	**0.0069 ~~B~~ J**	**0.080**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AD**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0016	
Tin	**0.12 ~~B~~ J**	**0.40**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AE**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.085	
Zinc	**51.5**	**0.40**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TJ1AF**
		Dilution Factor: 0.8		Analysis Time..: 21:02	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0094	

Prep Batch #...: 0305011

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78TJ1AJ
		Dilution Factor: 1		Analysis Time..: 09:27	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-E

TOTAL Metals

Lot-Sample #...: C0J090480-019 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....: 77

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	14.0	2.2	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AQ
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.17	
Antimony	0.030 ~~B,J~~ B	0.14	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AR
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0024	
Arsenic	1.2 J	0.072	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AT
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.012	
Beryllium	ND	0.072	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AU
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0027	
Cadmium	0.57	0.072	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AV
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0066	
Chromium	0.89 J	0.14	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AW
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0058	
Cobalt	0.29	0.036	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AX
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0018	
Copper	41.6 J	0.14	mg/kg	SW846 6020	10/26-11/02/10	L78TK1A0
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0061	
Iron	97.1 J	3.6	mg/kg	SW846 6020	10/26-11/02/10	L78TK1A1
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.21	

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-E

TOTAL Metals

Lot-Sample #...: C0J090480-019 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.37**	**0.072**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1A2**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0024	
Manganese	**13.8**	**0.036**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1A3**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.010	
Nickel	**0.46**	**0.072**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1A4**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0049	
Selenium	**1.1 J**	**0.36**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1AA**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.029	
Silver	**0.89**	**0.072**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1AC**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0017	
Thallium	ND	0.072	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AD
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0014	
Tin	ND	0.36	mg/kg	SW846 6020	10/26-11/02/10	L78TK1AE
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.076	
Zinc	**30.6**	**0.36**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L78TK1AF**
		Dilution Factor: 0.72		Analysis Time..: 21:07	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0084	

Prep Batch #...: 0305011

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L78TK1AJ
		Dilution Factor: 1		Analysis Time..: 09:28	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

LW
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EA Engineering, Science and Technology

Client Sample ID: SRM

TOTAL Metals

Lot-Sample #...: C0J090480-020 Matrix.....: BIOLOGIC
Date Sampled...: 10/04/10 Date Received..: 10/07/10
% Moisture.....:

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	34.6	2.7	mg/kg	SW846 6020	10/26-11/02/10	L787N1AD
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.21	
Antimony	0.031 B ~~J~~ B	0.18	mg/kg	SW846 6020	10/26-11/02/10	L787N1AE
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0030	
Arsenic	7.1 J	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AF
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.015	
Beryllium	0.0066 ~~B~~ J	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AG
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0033	
Cadmium	2.3	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AH
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0082	
Chromium	ND	0.18	mg/kg	SW846 6020	10/26-11/02/10	L787N1AJ
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0072	
Cobalt	0.32	0.045	mg/kg	SW846 6020	10/26-11/02/10	L787N1AK
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0022	
Copper	62.6 J	0.18	mg/kg	SW846 6020	10/26-11/02/10	L787N1AL
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0076	
Iron	173 J	4.5	mg/kg	SW846 6020	10/26-11/02/10	L787N1AM
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.26	

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EA Engineering, Science and Technology

Client Sample ID: SRM

TOTAL Metals

Lot-Sample #...: C0J090480-020 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	0.29	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AN
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0031	
Manganese	17.5	0.045	mg/kg	SW846 6020	10/26-11/02/10	L787N1AP
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.013	
Nickel	0.83	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AQ
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0061	
Selenium	2.5 ~~B~~	0.45	mg/kg	SW846 6020	10/26-11/02/10	L787N1AR
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.037	
Silver	0.61	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AT
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0022	
Thallium	0.0095 ~~B~~ J	0.090	mg/kg	SW846 6020	10/26-11/02/10	L787N1AU
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0018	
Tin	0.14 ~~B~~ J	0.45	mg/kg	SW846 6020	10/26-11/02/10	L787N1AV
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.095	
Zinc	1260	0.45	mg/kg	SW846 6020	10/26-11/02/10	L787N1AW
		Dilution Factor: 0.9		Analysis Time..: 21:27	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.011	

Prep Batch #...: 0305011

Mercury	0.031 ~~B~~ J	0.033	mg/kg	SW846 7471A	11/01/10	L787N1AX
		Dilution Factor: 1		Analysis Time..: 09:33	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-D

TOTAL Metals

Lot-Sample #...: C0J090480-021 Matrix.....: BIOLOGIC
Date Sampled...: 10/11/10 Date Received..: 10/12/10
% Moisture.....: 73

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 0299404						
Aluminum	6.7	2.5	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AP
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.19	
Antimony	0.090 ~~B,J~~ B	0.16	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AQ
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0027	
Arsenic	2.2 ~~J~~	0.082	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AR
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.014	
Beryllium	ND	0.082	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AT
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0030	
Cadmium	0.14	0.082	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AU
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0075	
Chromium	0.30 ~~J~~	0.16	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AV
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0066	
Cobalt	0.36	0.041	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AW
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0020	
Copper	19.0 ~~J~~	0.16	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AX
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0070	
Iron	45.9 ~~J~~	4.1	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1A0
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.24	

(Continued on next page)

MW
12/7/10

21

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-D

TOTAL Metals

Lot-Sample #...: C0J090480-021 Matrix.....: BIOLOGI

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION-ANALYSIS DATE	WORK ORDER #
Lead	**0.087**	**0.082**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1A1**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0028	
Manganese	**10.3**	**0.041**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1A2**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.012	
Nickel	**0.61**	**0.082**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1A3**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0056	
Selenium	**1.1 ~~B~~**	**0.41**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1AA**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.033	
Silver	**0.21**	**0.082**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1AC**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0020	
Thallium	ND	0.082	mg/kg	SW846 6020	10/26-11/02/10	L8CAK1AD
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0016	
Tin	**0.14 ~~B~~ J**	**0.41**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1AE**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.087	
Zinc	**43.3**	**0.41**	**mg/kg**	**SW846 6020**	**10/26-11/02/10**	**L8CAK1AF**
		Dilution Factor: 0.82		Analysis Time..: 21:46	Analyst ID.....: 400149	
		Instrument ID..: ICPMS2		MS Run #.....: 0299237	MDL.....: 0.0096	

Prep Batch #...: 0305011

Mercury	ND	0.033	mg/kg	SW846 7471A	11/01/10	L8CAK1AJ
		Dilution Factor: 1		Analysis Time..: 09:35	Analyst ID.....: 031043	
		Instrument ID..: HGHYDRA		MS Run #.....: 0305003	MDL.....: 0.011	

NOTE(S):

B Estimated result. Result is less than RL.

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

NW
12/7/10

ENVIRONMENTAL
Data Services, Inc.

PCB CONGENERS

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J090480

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-CASA-MT-A	C0J090480-001	Tissue
2	PR-CASA-MT-B	C0J090480-002	Tissue
3	PR-CASA-MT-C	C0J090480-003	Tissue
4	PR-CASA-MT-D	C0J090480-004	Tissue
5	PR-CASA-MT-E	C0J090480-005	Tissue
6	PR-CASA-MU-A	C0J090480-006	Tissue
7	PR-CASA-MU-B	C0J090480-007	Tissue
8	PR-CASA-MU-C	C0J090480-008	Tissue
9	PR-CASA-MU-E	C0J090480-009	Tissue
10	CP-CASA-MT-A	C0J090480-010	Tissue
11	CP-CASA-MT-B	C0J090480-011	Tissue
12	CP-CASA-MT-C	C0J090480-012	Tissue
13	CP-CASA-MT-D	C0J090480-013	Tissue
14	CP-CASA-MT-E	C0J090480-014	Tissue
14MS	CP-CASA-MT-EMS	C0J090480-014MS	Tissue
14MSD	CP-CASA-MT-EMSD	C0J090480-014MSD	Tissue
15	CP-CASA-MU-A	C0J090480-015	Tissue
16	CP-CASA-MU-B	C0J090480-016	Tissue
17	CP-CASA-MU-C	C0J090480-017	Tissue
18	CP-CASA-MU-D	C0J090480-018	Tissue
19	CP-CASA-MU-E	C0J090480-019	Tissue
19MS	CP-CASA-MU-EMS	C0J090480-019MS	Tissue
19MSD	CP-CASA-MU-EMSD	C0J090480-019MSD	Tissue
20	SRM	C0J090480-020	Tissue
21	PR-CASA-MU-D	C0J090480-021	Tissue

The USEPA "Region III Interim Guidelines for the Validation of Data generated using Method 1668 PCB Congener Data," Revision 0, April 21, 2004 was used in evaluating the data in this summary report.

Holding Times - Holding time criteria were met.

Initial Calibration - The initial calibration exhibited acceptable %RSD values.

Calibration Verification - The continuing calibration exhibited acceptable %D values.

Surrogates - All samples exhibited acceptable surrogate recoveries.

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
19	PCB 49	27%/34%/OK	L/UL
	PCB 118	OK/147%/OK	None- See Comp. Quant.

Laboratory Control Sample - The LCS sample exhibited acceptable %R values.

Method Blank - The method blanks were free of contamination

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Identification - Retention times were acceptable and no further action was taken.

Compound Quantitation - Several compounds were flagged (PG) by the laboratory indicating that the percent difference (% D) between the original and confirmation analyses is greater than 40%. The reviewer flagged these and all results with >25% D as estimated (J).

EDS sample ID#s 6-9, 15-17, 19, and 21 were analyzed at various dilutions due to the high concentrations of congeners detected.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-A

GC Semivolatiles

Lot-Sample #...:	C0J090480-001	**Work Order #...:**	L78R01AC	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	06:28		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.3 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**0.90 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.7 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**1.8 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**3.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**9.2**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**2.4**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**1.2 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**2.8**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	49	(35 - 140)
PCB 205 (BZ)	40	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

RW
12/7/10

2

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-B

GC Semivolatiles

Lot-Sample #...:	C0J090480-002	**Work Order #...:**	L78R11AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	06:53		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	80	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**0.93 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**1.0 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**2.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**5.4**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.3 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.8 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	53	(35 - 140)
PCB 205 (BZ)	42	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/7/10

3

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-C

GC Semivolatiles

Lot-Sample #...:	C0J090480-003	**Work Order #...:**	L78R21AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	07:18		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**0.89 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.4 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**0.85 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**1.8 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**3.6**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.2 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	ND	2.0	ug/kg	1.0
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	44	(35 - 140)
PCB 205 (BZ)	37	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

LW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-D

GC Semivolatiles

Lot-Sample #...:	C0J090480-004	**Work Order #...:**	L78R31AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	07:43		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.3 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**0.87 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.4 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**1.0 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**2.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**6.2**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**0.86 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**2.1 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**1.0 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.7 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	46	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MJ
12/7/10

5

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-E

GC Semivolatiles

Lot-Sample #...:	C0J090480-005	**Work Order #...:**	L78R41AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	08:08		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.4 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	78	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**0.87 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.4 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**0.88 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**1.7 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**3.7**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.2 ~~J~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.3 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	43	(35 - 140)
PCB 205 (BZ)	38	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/7/10

6

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-A

GC Semivolatiles

Lot-Sample #...:	C0J090480-006	**Work Order #...:**	L78R51AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	18:34		
Dilution Factor:	4	**Initial Wgt/Vol:**	1.3 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	79	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	8.0	ug/kg	3.6
PCB 18 (BZ)	ND	8.0	ug/kg	2.7
PCB 28 (BZ)	**9.7 ~~PG~~ J**	**8.0**	**ug/kg**	**3.3**
PCB 44 (BZ)	ND	8.0	ug/kg	3.7
PCB 49 (BZ)	ND	8.0	ug/kg	3.9
PCB 52 (BZ)	ND	8.0	ug/kg	3.8
PCB 66 (BZ)	**24**	**8.0**	**ug/kg**	**3.4**
PCB 77 (BZ)	ND	8.0	ug/kg	3.3
PCB 87 (BZ)	ND	8.0	ug/kg	3.4
PCB 90 (BZ)	ND	8.0	ug/kg	4.0
PCB 101 (BZ)	**4.6 ~~J,PG~~ J**	**8.0**	**ug/kg**	**2.8**
PCB 105 (BZ)	**7.6 J**	**8.0**	**ug/kg**	**4.2**
PCB 118 (BZ)	**19 ~~PG~~ J**	**8.0**	**ug/kg**	**3.4**
PCB 126 (BZ)	ND	8.0	ug/kg	3.9
PCB 128 (BZ)	**7.0 J**	**8.0**	**ug/kg**	**3.4**
PCB 138 (BZ)	**35 ~~PG~~ J**	**8.0**	**ug/kg**	**2.7**
PCB 153 (BZ)	**96**	**8.0**	**ug/kg**	**2.9**
PCB 156 (BZ)	**5.6 ~~J,PG~~ J**	**8.0**	**ug/kg**	**3.5**
PCB 169 (BZ)	ND	8.0	ug/kg	3.6
PCB 170 (BZ)	**18 J**	**8.0**	**ug/kg**	**3.3**
PCB 180 (BZ)	**32 J**	**8.0**	**ug/kg**	**3.1**
PCB 183 (BZ)	**14 J**	**8.0**	**ug/kg**	**3.2**
PCB 184 (BZ)	ND	8.0	ug/kg	4.1
PCB 187 (BZ)	**34**	**8.0**	**ug/kg**	**4.2**
PCB 195 (BZ)	ND	8.0	ug/kg	4.0
PCB 206 (BZ)	**8.0**	**8.0**	**ug/kg**	**4.1**
PCB 209 (BZ)	**8.3**	**8.0**	**ug/kg**	**3.6**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	52	(35 - 140)
PCB 205 (BZ)	51	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/7/10

7

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-B

GC Semivolatiles

Lot-Sample #...:	C0J090480-007	**Work Order #...:**	L78R61AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	18:59		
Dilution Factor:	4	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	83	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	8.0	ug/kg	3.6
PCB 18 (BZ)	ND	8.0	ug/kg	2.7
PCB 28 (BZ)	**4.8 ~~J, PG~~ J**	**8.0**	**ug/kg**	**3.3**
PCB 44 (BZ)	ND	8.0	ug/kg	3.7
PCB 49 (BZ)	ND	8.0	ug/kg	3.9
PCB 52 (BZ)	ND	8.0	ug/kg	3.8
PCB 66 (BZ)	**16 J**	**8.0**	**ug/kg**	**3.4**
PCB 77 (BZ)	ND	8.0	ug/kg	3.3
PCB 87 (BZ)	ND	8.0	ug/kg	3.4
PCB 90 (BZ)	ND	8.0	ug/kg	4.0
PCB 101 (BZ)	ND	8.0	ug/kg	2.8
PCB 105 (BZ)	**6.8 J**	**8.0**	**ug/kg**	**4.2**
PCB 118 (BZ)	**15 ~~PG~~ J**	**8.0**	**ug/kg**	**3.4**
PCB 126 (BZ)	ND	8.0	ug/kg	3.9
PCB 128 (BZ)	**6.5 J**	**8.0**	**ug/kg**	**3.4**
PCB 138 (BZ)	**37 ~~PG~~ J**	**8.0**	**ug/kg**	**2.7**
PCB 153 (BZ)	**97**	**8.0**	**ug/kg**	**2.9**
PCB 156 (BZ)	**5.5 ~~J, PG~~ J**	**8.0**	**ug/kg**	**3.5**
PCB 169 (BZ)	ND	8.0	ug/kg	3.6
PCB 170 (BZ)	**17 J**	**8.0**	**ug/kg**	**3.3**
PCB 180 (BZ)	**34 J**	**8.0**	**ug/kg**	**3.1**
PCB 183 (BZ)	**14 J**	**8.0**	**ug/kg**	**3.2**
PCB 184 (BZ)	ND	8.0	ug/kg	4.1
PCB 187 (BZ)	**36**	**8.0**	**ug/kg**	**4.2**
PCB 195 (BZ)	ND	8.0	ug/kg	4.0
PCB 206 (BZ)	**6.9 J**	**8.0**	**ug/kg**	**4.1**
PCB 209 (BZ)	**6.9 J**	**8.0**	**ug/kg**	**3.6**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	54	(35 - 140)
PCB 205 (BZ)	55	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NeJ
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-C

GC Semivolatiles

Lot-Sample #...:	C0J090480-008	**Work Order #...:**	L78R71AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	19:24		
Dilution Factor:	5	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	75	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	10	ug/kg	4.5
PCB 18 (BZ)	ND	10	ug/kg	3.4
PCB 28 (BZ)	**15 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 44 (BZ)	ND	10	ug/kg	4.6
PCB 49 (BZ)	ND	10	ug/kg	4.9
PCB 52 (BZ)	ND	10	ug/kg	4.8
PCB 66 (BZ)	**36**	**10**	**ug/kg**	**4.2**
PCB 77 (BZ)	ND	10	ug/kg	4.1
PCB 87 (BZ)	ND	10	ug/kg	4.2
PCB 90 (BZ)	ND	10	ug/kg	5.0
PCB 101 (BZ)	ND	10	ug/kg	3.4
PCB 105 (BZ)	**14**	**10**	**ug/kg**	**5.3**
PCB 118 (BZ)	**26 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 126 (BZ)	ND	10	ug/kg	4.9
PCB 128 (BZ)	**8.9 J**	**10**	**ug/kg**	**4.2**
PCB 138 (BZ)	**77 J**	**10**	**ug/kg**	**3.4**
PCB 153 (BZ)	**120**	**10**	**ug/kg**	**3.6**
PCB 156 (BZ)	**6.5 ~~J,PG~~ J**	**10**	**ug/kg**	**4.3**
PCB 169 (BZ)	ND	10	ug/kg	4.5
PCB 170 (BZ)	**28**	**10**	**ug/kg**	**4.1**
PCB 180 (BZ)	**34 ~~PG~~ J**	**10**	**ug/kg**	**3.9**
PCB 183 (BZ)	**21 J**	**10**	**ug/kg**	**4.0**
PCB 184 (BZ)	ND	10	ug/kg	5.1
PCB 187 (BZ)	**36**	**10**	**ug/kg**	**5.2**
PCB 195 (BZ)	ND	10	ug/kg	5.0
PCB 206 (BZ)	**8.6 J**	**10**	**ug/kg**	**5.1**
PCB 209 (BZ)	**7.8 J**	**10**	**ug/kg**	**4.4**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	56	(35 - 140)
PCB 205 (BZ)	58	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-E

GC Semivolatiles

Lot-Sample #...:	C0J090480-009	**Work Order #...:**	L78R81AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	19:49		
Dilution Factor:	5	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	10	ug/kg	4.5
PCB 18 (BZ)	ND	10	ug/kg	3.4
PCB 28 (BZ)	**17 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 44 (BZ)	ND	10	ug/kg	4.6
PCB 49 (BZ)	ND	10	ug/kg	4.9
PCB 52 (BZ)	ND	10	ug/kg	4.8
PCB 66 (BZ)	**45**	**10**	**ug/kg**	**4.2**
PCB 77 (BZ)	ND	10	ug/kg	4.1
PCB 87 (BZ)	ND	10	ug/kg	4.2
PCB 90 (BZ)	ND	10	ug/kg	5.0
PCB 101 (BZ)	ND	10	ug/kg	3.4
PCB 105 (BZ)	**16**	**10**	**ug/kg**	**5.3**
PCB 118 (BZ)	**30 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 126 (BZ)	ND	10	ug/kg	4.9
PCB 128 (BZ)	**9.0 J**	**10**	**ug/kg**	**4.2**
PCB 138 (BZ)	**80 J**	**10**	**ug/kg**	**3.4**
PCB 153 (BZ)	**130**	**10**	**ug/kg**	**3.6**
PCB 156 (BZ)	**7.9 ~~J,PG~~ J**	**10**	**ug/kg**	**4.3**
PCB 169 (BZ)	ND	10	ug/kg	4.5
PCB 170 (BZ)	**28 J**	**10**	**ug/kg**	**4.1**
PCB 180 (BZ)	**49 J**	**10**	**ug/kg**	**3.9**
PCB 183 (BZ)	**16 ~~PG~~ J**	**10**	**ug/kg**	**4.0**
PCB 184 (BZ)	ND	10	ug/kg	5.1
PCB 187 (BZ)	**41**	**10**	**ug/kg**	**5.2**
PCB 195 (BZ)	ND	10	ug/kg	5.0
PCB 206 (BZ)	**7.0 J**	**10**	**ug/kg**	**5.1**
PCB 209 (BZ)	**6.9 J**	**10**	**ug/kg**	**4.4**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	58	(35 - 140)
PCB 205 (BZ)	60	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-A

GC Semivolatiles

Lot-Sample #...:	C0J090480-010	**Work Order #...:**	L78R91AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	10:13		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	ND	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**1.6 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**2.7**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	ND	2.0	ug/kg	0.79
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	ND	2.0	ug/kg	1.0
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	48	(35 - 140)
PCB 205 (BZ)	45	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/1/10

11

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-B

GC Semivolatiles

Lot-Sample #...:	C0J090480-011	**Work Order #...:**	L78TA1AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	11:53		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.2 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	ND	2.0	ug/kg	0.85
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**1.6 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**3.0**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	ND	2.0	ug/kg	0.79
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	ND	2.0	ug/kg	1.0
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	50	(35 - 140)
PCB 205 (BZ)	44	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-C

GC Semivolatiles

Lot-Sample #...:	C0J090480-012	**Work Order #...:**	L78TC1AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	12:18		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.2 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**1.5 ~~J, PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**2.7 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**6.6**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.5 ~~J~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	44	(35 - 140)
PCB 205 (BZ)	40	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

JW 12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-D

GC Semivolatiles

Lot-Sample #...:	C0J090480-013	**Work Order #...:**	L78TD1AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	12:43		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.3 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**1.0 J**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	ND	2.0	ug/kg	0.69
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**0.91 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**1.7 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**3.8 J**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**0.97 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	ND	2.0	ug/kg	0.81
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	ND	2.0	ug/kg	1.0
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	**0.93 J**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	42	(35 - 140)
PCB 205 (BZ)	39	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-E

GC Semivolatiles

Lot-Sample #...:	C0J090480-014	**Work Order #...:**	L78TE1CV	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	13:08		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	ND	2.0	ug/kg	0.84
PCB 44 (BZ)	ND	2.0	ug/kg	0.92
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**1.1 ~~J~~ J**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	ND	2.0	ug/kg	1.1
PCB 118 (BZ)	**1.6 ~~J,PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	ND	2.0	ug/kg	0.85
PCB 138 (BZ)	**3.2 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**6.7**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	**1.7 ~~J~~ J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**0.83 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.8 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	**1.1 J**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	44	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-A

GC Semivolatiles

Lot-Sample #...:	C0J090480-015	**Work Order #...:**	L78TF1AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0316050	**Analysis Time..:**	10:32		
Dilution Factor:	2	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	4.0	ug/kg	1.8
PCB 18 (BZ)	ND	4.0	ug/kg	1.3
PCB 28 (BZ)	**8.7 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 44 (BZ)	ND	4.0	ug/kg	1.8
PCB 49 (BZ)	**21**	**4.0**	**ug/kg**	**1.9**
PCB 52 (BZ)	ND	4.0	ug/kg	1.9
PCB 66 (BZ)	**25**	**4.0**	**ug/kg**	**1.7**
PCB 77 (BZ)	ND	4.0	ug/kg	1.6
PCB 87 (BZ)	ND	4.0	ug/kg	1.7
PCB 90 (BZ)	ND	4.0	ug/kg	2.0
PCB 101 (BZ)	**2.1 ~~J,PG~~ J**	**4.0**	**ug/kg**	**1.4**
PCB 105 (BZ)	**11**	**4.0**	**ug/kg**	**2.1**
PCB 118 (BZ)	**19 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 126 (BZ)	ND	4.0	ug/kg	1.9
PCB 128 (BZ)	**6.9**	**4.0**	**ug/kg**	**1.7**
PCB 138 (BZ)	**36 ~~PG~~ J**	**4.0**	**ug/kg**	**1.3**
PCB 153 (BZ)	**76**	**4.0**	**ug/kg**	**1.5**
PCB 156 (BZ)	**4.6 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 169 (BZ)	ND	4.0	ug/kg	1.8
PCB 170 (BZ)	**14 J**	**4.0**	**ug/kg**	**1.6**
PCB 180 (BZ)	**23 J**	**4.0**	**ug/kg**	**1.6**
PCB 183 (BZ)	**8.5 ~~PG~~ J**	**4.0**	**ug/kg**	**1.6**
PCB 184 (BZ)	ND	4.0	ug/kg	2.0
PCB 187 (BZ)	**22**	**4.0**	**ug/kg**	**2.1**
PCB 195 (BZ)	ND	4.0	ug/kg	2.0
PCB 206 (BZ)	**8.1**	**4.0**	**ug/kg**	**2.1**
PCB 209 (BZ)	**9.2**	**4.0**	**ug/kg**	**1.8**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	56	(35 - 140)
PCB 205 (BZ)	58	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-B

GC Semivolatiles

Lot-Sample #...:	C0J090480-016	**Work Order #...:**	L78TG1AJ	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0316050	**Analysis Time..:**	10:57		
Dilution Factor:	2	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	76	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	4.0	ug/kg	1.8
PCB 18 (BZ)	ND	4.0	ug/kg	1.3
PCB 28 (BZ)	**9.0 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 44 (BZ)	ND	4.0	ug/kg	1.8
PCB 49 (BZ)	**20**	**4.0**	**ug/kg**	**1.9**
PCB 52 (BZ)	ND	4.0	ug/kg	1.9
PCB 66 (BZ)	**25**	**4.0**	**ug/kg**	**1.7**
PCB 77 (BZ)	ND	4.0	ug/kg	1.6
PCB 87 (BZ)	ND	4.0	ug/kg	1.7
PCB 90 (BZ)	ND	4.0	ug/kg	2.0
PCB 101 (BZ)	**3.8 ~~J, PG~~ J**	**4.0**	**ug/kg**	**1.4**
PCB 105 (BZ)	**11**	**4.0**	**ug/kg**	**2.1**
PCB 118 (BZ)	**20 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 126 (BZ)	ND	4.0	ug/kg	1.9
PCB 128 (BZ)	**6.7**	**4.0**	**ug/kg**	**1.7**
PCB 138 (BZ)	**35 ~~PG~~ J**	**4.0**	**ug/kg**	**1.3**
PCB 153 (BZ)	**77**	**4.0**	**ug/kg**	**1.5**
PCB 156 (BZ)	**4.8 ~~PG~~ J**	**4.0**	**ug/kg**	**1.7**
PCB 169 (BZ)	ND	4.0	ug/kg	1.8
PCB 170 (BZ)	**15**	**4.0**	**ug/kg**	**1.6**
PCB 180 (BZ)	**24 J**	**4.0**	**ug/kg**	**1.6**
PCB 183 (BZ)	**7.4 ~~PG~~ J**	**4.0**	**ug/kg**	**1.6**
PCB 184 (BZ)	ND	4.0	ug/kg	2.0
PCB 187 (BZ)	**22**	**4.0**	**ug/kg**	**2.1**
PCB 195 (BZ)	ND	4.0	ug/kg	2.0
PCB 206 (BZ)	**8.9**	**4.0**	**ug/kg**	**2.1**
PCB 209 (BZ)	**9.9**	**4.0**	**ug/kg**	**1.8**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	44	(35 - 140)
PCB 205 (BZ)	48	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MJ
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-C

GC Semivolatiles

Lot-Sample #...:	C0J090480-017	**Work Order #...:**	L78TH1AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0316050	**Analysis Time..:**	11:22		
Dilution Factor:	4	**Initial Wgt/Vol:**	1.3 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	75	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	8.0	ug/kg	3.6
PCB 18 (BZ)	ND	8.0	ug/kg	2.7
PCB 28 (BZ)	**6.1 ~~J,PG~~ J**	**8.0**	**ug/kg**	**3.3**
PCB 44 (BZ)	ND	8.0	ug/kg	3.7
PCB 49 (BZ)	**21**	**8.0**	**ug/kg**	**3.9**
PCB 52 (BZ)	ND	8.0	ug/kg	3.8
PCB 66 (BZ)	**16 J**	**8.0**	**ug/kg**	**3.4**
PCB 77 (BZ)	ND	8.0	ug/kg	3.3
PCB 87 (BZ)	ND	8.0	ug/kg	3.4
PCB 90 (BZ)	ND	8.0	ug/kg	4.0
PCB 101 (BZ)	**8.1 J**	**8.0**	**ug/kg**	**2.8**
PCB 105 (BZ)	**10**	**8.0**	**ug/kg**	**4.2**
PCB 118 (BZ)	**20 ~~PG~~ J**	**8.0**	**ug/kg**	**3.4**
PCB 126 (BZ)	ND	8.0	ug/kg	3.9
PCB 128 (BZ)	**7.8 J**	**8.0**	**ug/kg**	**3.4**
PCB 138 (BZ)	**41 ~~PG~~ J**	**8.0**	**ug/kg**	**2.7**
PCB 153 (BZ)	**93**	**8.0**	**ug/kg**	**2.9**
PCB 156 (BZ)	**5.7 ~~J,PG~~ J**	**8.0**	**ug/kg**	**3.5**
PCB 169 (BZ)	ND	8.0	ug/kg	3.6
PCB 170 (BZ)	**17 J**	**8.0**	**ug/kg**	**3.3**
PCB 180 (BZ)	**28 J**	**8.0**	**ug/kg**	**3.1**
PCB 183 (BZ)	**9.4 ~~PG~~ J**	**8.0**	**ug/kg**	**3.2**
PCB 184 (BZ)	ND	8.0	ug/kg	4.1
PCB 187 (BZ)	**30**	**8.0**	**ug/kg**	**4.2**
PCB 195 (BZ)	ND	8.0	ug/kg	4.0
PCB 206 (BZ)	**10**	**8.0**	**ug/kg**	**4.1**
PCB 209 (BZ)	**10**	**8.0**	**ug/kg**	**3.6**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	58	(35 - 140)
PCB 205 (BZ)	70	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

lw
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-D

GC Semivolatiles

Lot-Sample #...:	C0J090480-018	**Work Order #...:**	L78TJ1AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0316050	**Analysis Time..:**	15:39		
Dilution Factor:	1	**Initial Wgt/Vol:**	1.4 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	74	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	ND	2.0	ug/kg	0.67
PCB 28 (BZ)	**6.8 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**1.3 J**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	ND	2.0	ug/kg	0.97
PCB 52 (BZ)	ND	2.0	ug/kg	0.96
PCB 66 (BZ)	**21**	**2.0**	**ug/kg**	**0.84**
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	ND	2.0	ug/kg	0.84
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**3.0 ~~PG~~ J**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**8.6 J**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**14 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**5.4**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**25 ~~PG~~ J**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**51**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	**3.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.86**
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	**12 J**	**2.0**	**ug/kg**	**0.82**
PCB 180 (BZ)	**17 J**	**2.0**	**ug/kg**	**0.79**
PCB 183 (BZ)	**5.2 ~~PG~~ J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**17**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	**1.3 J**	**2.0**	**ug/kg**	**1.0**
PCB 206 (BZ)	**8.8**	**2.0**	**ug/kg**	**1.0**
PCB 209 (BZ)	**12**	**2.0**	**ug/kg**	**0.89**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	46	(35 - 140)
PCB 205 (BZ)	41	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-E

GC Semivolatiles

Lot-Sample #...:	C0J090480-019	**Work Order #...:**	L78TK1AP	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0316050	**Analysis Time..:**	11:47		
Dilution Factor:	5	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	77	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	10	ug/kg	4.5
PCB 18 (BZ)	ND	10	ug/kg	3.4
PCB 28 (BZ)	**6.9 ~~J,PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 44 (BZ)	ND	10	ug/kg	4.6
PCB 49 (BZ)	**27 L**	**10**	**ug/kg**	**4.9**
PCB 52 (BZ)	ND	10	ug/kg	4.8
PCB 66 (BZ)	**19**	**10**	**ug/kg**	**4.2**
PCB 77 (BZ)	ND	10	ug/kg	4.1
PCB 87 (BZ)	ND	10	ug/kg	4.2
PCB 90 (BZ)	ND	10	ug/kg	5.0
PCB 101 (BZ)	**4.5 ~~J,PG~~ J**	**10**	**ug/kg**	**3.4**
PCB 105 (BZ)	**12**	**10**	**ug/kg**	**5.3**
PCB 118 (BZ)	**22 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 126 (BZ)	ND	10	ug/kg	4.9
PCB 128 (BZ)	**9.1 J**	**10**	**ug/kg**	**4.2**
PCB 138 (BZ)	**45 ~~PG~~ J**	**10**	**ug/kg**	**3.4**
PCB 153 (BZ)	**110**	**10**	**ug/kg**	**3.6**
PCB 156 (BZ)	**6.0 ~~J,PG~~ J**	**10**	**ug/kg**	**4.3**
PCB 169 (BZ)	ND	10	ug/kg	4.5
PCB 170 (BZ)	**19**	**10**	**ug/kg**	**4.1**
PCB 180 (BZ)	**35 J**	**10**	**ug/kg**	**3.9**
PCB 183 (BZ)	**11 ~~PG~~ J**	**10**	**ug/kg**	**4.0**
PCB 184 (BZ)	ND	10	ug/kg	5.1
PCB 187 (BZ)	**34**	**10**	**ug/kg**	**5.2**
PCB 195 (BZ)	ND	10	ug/kg	5.0
PCB 206 (BZ)	**13**	**10**	**ug/kg**	**5.1**
PCB 209 (BZ)	**13**	**10**	**ug/kg**	**4.4**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	56	(35 - 140)
PCB 205 (BZ)	73	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: SRM

GC Semivolatiles

Lot-Sample #...:	C0J090480-020	Work Order #...:	L787N1AC	Matrix.....:	BIOLOGIC
Date Sampled...:	10/04/10	Date Received..:	10/07/10	MS Run #.....:	0316026
Prep Date.....:	11/12/10	Analysis Date..:	11/17/10		
Prep Batch #...:	0316050	Analysis Time..:	14:18		
Dilution Factor:	1	Initial Wgt/Vol:	1.2 g	Final Wgt/Vol..:	4 mL
% Moisture.....:		Analyst ID.....:	001797	Instrument ID..:	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	2.0	ug/kg	0.90
PCB 18 (BZ)	**1.7 J**	**2.0**	**ug/kg**	**0.67**
PCB 28 (BZ)	**3.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 44 (BZ)	**2.8**	**2.0**	**ug/kg**	**0.92**
PCB 49 (BZ)	**4.1**	**2.0**	**ug/kg**	**0.97**
PCB 52 (BZ)	**4.6 J**	**2.0**	**ug/kg**	**0.96**
PCB 66 (BZ)	ND	2.0	ug/kg	0.84
PCB 77 (BZ)	ND	2.0	ug/kg	0.82
PCB 87 (BZ)	**2.6 ~~PG~~ J**	**2.0**	**ug/kg**	**0.84**
PCB 90 (BZ)	ND	2.0	ug/kg	1.0
PCB 101 (BZ)	**3.8**	**2.0**	**ug/kg**	**0.69**
PCB 105 (BZ)	**2.9**	**2.0**	**ug/kg**	**1.1**
PCB 118 (BZ)	**3.3 ~~PG~~ J**	**2.0**	**ug/kg**	**0.85**
PCB 126 (BZ)	ND	2.0	ug/kg	0.97
PCB 128 (BZ)	**1.1 J**	**2.0**	**ug/kg**	**0.85**
PCB 138 (BZ)	**7.9**	**2.0**	**ug/kg**	**0.67**
PCB 153 (BZ)	**8.1 J**	**2.0**	**ug/kg**	**0.73**
PCB 156 (BZ)	ND	2.0	ug/kg	0.86
PCB 169 (BZ)	ND	2.0	ug/kg	0.90
PCB 170 (BZ)	ND	2.0	ug/kg	0.82
PCB 180 (BZ)	ND	2.0	ug/kg	0.79
PCB 183 (BZ)	**0.97 J**	**2.0**	**ug/kg**	**0.81**
PCB 184 (BZ)	ND	2.0	ug/kg	1.0
PCB 187 (BZ)	**1.9 J**	**2.0**	**ug/kg**	**1.0**
PCB 195 (BZ)	ND	2.0	ug/kg	1.0
PCB 206 (BZ)	ND	2.0	ug/kg	1.0
PCB 209 (BZ)	ND	2.0	ug/kg	0.89

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	41	(35 - 140)
PCB 205 (BZ)	35	(35 - 140)

NOTE(S):

J Estimated result. Result is less than RL.

PG The percent difference between the original and confirmation analyses is greater than 40%.

MJ
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-D

GC Semivolatiles

Lot-Sample #...:	C0J090480-021	**Work Order #...:**	L8CAK1AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/11/10	**Date Received..:**	10/12/10	**MS Run #.....:**	0316026
Prep Date.....:	11/12/10	**Analysis Date..:**	11/17/10		
Prep Batch #...:	0316050	**Analysis Time..:**	13:03		
Dilution Factor:	5	**Initial Wgt/Vol:**	1.2 g	**Final Wgt/Vol..:**	4 mL
% Moisture.....:	73	**Analyst ID.....:**	001797	**Instrument ID..:**	W/X
		Method.....:	SW846 8082 Congen		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
PCB 8 (BZ)	ND	10	ug/kg	4.5
PCB 18 (BZ)	ND	10	ug/kg	3.4
PCB 28 (BZ)	**34 J**	**10**	**ug/kg**	**4.2**
PCB 44 (BZ)	ND	10	ug/kg	4.6
PCB 49 (BZ)	**49**	**10**	**ug/kg**	**4.9**
PCB 52 (BZ)	ND	10	ug/kg	4.8
PCB 66 (BZ)	**56**	**10**	**ug/kg**	**4.2**
PCB 77 (BZ)	ND	10	ug/kg	4.1
PCB 87 (BZ)	ND	10	ug/kg	4.2
PCB 90 (BZ)	ND	10	ug/kg	5.0
PCB 101 (BZ)	**12 J**	**10**	**ug/kg**	**3.4**
PCB 105 (BZ)	**22**	**10**	**ug/kg**	**5.3**
PCB 118 (BZ)	**38 ~~PG~~ J**	**10**	**ug/kg**	**4.2**
PCB 126 (BZ)	ND	10	ug/kg	4.9
PCB 128 (BZ)	**13**	**10**	**ug/kg**	**4.2**
PCB 138 (BZ)	**71 ~~PG~~ J**	**10**	**ug/kg**	**3.4**
PCB 153 (BZ)	**140**	**10**	**ug/kg**	**3.6**
PCB 156 (BZ)	**10 ~~PG~~ J**	**10**	**ug/kg**	**4.3**
PCB 169 (BZ)	ND	10	ug/kg	4.5
PCB 170 (BZ)	**28**	**10**	**ug/kg**	**4.1**
PCB 180 (BZ)	**49 J**	**10**	**ug/kg**	**3.9**
PCB 183 (BZ)	**22 J**	**10**	**ug/kg**	**4.0**
PCB 184 (BZ)	ND	10	ug/kg	5.1
PCB 187 (BZ)	**36**	**10**	**ug/kg**	**5.2**
PCB 195 (BZ)	ND	10	ug/kg	5.0
PCB 206 (BZ)	**7.2 J**	**10**	**ug/kg**	**5.1**
PCB 209 (BZ)	**7.3 J**	**10**	**ug/kg**	**4.4**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Tetrachloro-m-xylene	58	(35 - 140)
PCB 205 (BZ)	74	(35 - 140)

NOTE(S):

PG The percent difference between the original and confirmation analyses is greater than 40%.

J Estimated result. Result is less than RL.

MW
12/7/10

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS (PAH ONLY)

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: C0J090480

Client: Maryland Environmental Service, Millersville, MD Date: December 7, 2010

Laboratory: Test America, Inc., Pittsburgh, PA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-CASA-MT-A	C0J090480-001	Tissue
2	PR-CASA-MT-B	C0J090480-002	Tissue
3	PR-CASA-MT-C	C0J090480-003	Tissue
4	PR-CASA-MT-D	C0J090480-004	Tissue
5	PR-CASA-MT-E	C0J090480-005	Tissue
6	PR-CASA-MU-A	C0J090480-006	Tissue
7	PR-CASA-MU-B	C0J090480-007	Tissue
8	PR-CASA-MU-C	C0J090480-008	Tissue
9	PR-CASA-MU-E	C0J090480-009	Tissue
10	CP-CASA-MT-A	C0J090480-010	Tissue
11	CP-CASA-MT-B	C0J090480-011	Tissue
12	CP-CASA-MT-C	C0J090480-012	Tissue
13	CP-CASA-MT-D	C0J090480-013	Tissue
14	CP-CASA-MT-E	C0J090480-014	Tissue
14MS	CP-CASA-MT-EMS	C0J090480-014MS	Tissue
14MSD	CP-CASA-MT-EMSD	C0J090480-014MSD	Tissue
15	CP-CASA-MU-A	C0J090480-015	Tissue
16	CP-CASA-MU-B	C0J090480-016	Tissue
17	CP-CASA-MU-C	C0J090480-017	Tissue
18	CP-CASA-MU-D	C0J090480-018	Tissue
19	CP-CASA-MU-E	C0J090480-019	Tissue
19MS	CP-CASA-MU-EMS	C0J090480-019MS	Tissue
19MSD	CP-CASA-MU-EMSD	C0J090480-019MSD	Tissue
20	SRM	C0J090480-020	Tissue
21	PR-CASA-MU-D	C0J090480-021	Tissue

The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Holding Times - All samples were extracted within 14 days for tissue samples and analyzed within 40 days for all samples.

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria.

Initial Calibration - The initial calibrations exhibited acceptable %RSD and mean RRF values.

Continuing Calibration - The continuing calibrations exhibited acceptable %D and RRF values.

Surrogates - All samples exhibited acceptable surrogate recoveries except the following.

Sample ID	Surrogate	%R	Qualifier
6	S2= Terphenyl-d14	31%	None for one out per fraction
7	S2= Terphenyl-d14	24%	
9	S2= Terphenyl-d14	31%	
13	S2= Terphenyl-d14	28%	
15	S2= Terphenyl-d14	2.2%	L/R- Base/neutrals
	S6= 2,4,6-Tribromophenol	30%	None for one out per fraction
18	S2= Terphenyl-d14	32%	None for one out per fraction

MS/MSD - The MS/MSD sample exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier
14	Naphthalene	OK/42%/OK	L/UL

Laboratory Control Sample - The LCS samples exhibited acceptable %R values.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria except the following.

Sample ID	Internal Standard	Area Count	Qualifier
2	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
3	IS6= Perylene-d12	High	
4	IS6= Perylene-d12	High	
5	IS6= Perylene-d12	High	
6	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
7	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
9	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
10	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	

Sample ID	Internal Standard	Area Count	Qualifier
11	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
12	IS6= Perylene-d12	High	
13	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
14	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	
15	IS4= Phenanthrene-d10	High	None- All associated compounds ND
	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
16	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	
17	IS5= Chrysene-d12	High	
	IS6= Perylene-d12	High	
18	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	
19	IS5= Chrysene-d12	High	J- Positive results
	IS6= Perylene-d12	High	
21	IS5= Chrysene-d12	High	None- All associated compounds ND
	IS6= Perylene-d12	High	

Method Blank - The method blanks were free of contamination.

Field, Equipment Blank - Field QC samples were not included in this data package.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - Several samples were analyzed at various dilutions due to high concentrations of target compounds.

A standard reference material (SRM) QC sample was analyzed and the results are presented with the samples.

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-001	**Work Order #...:**	L78R01AA	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	14:35		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	**5.1 J**	**16**	**ug/kg**	**1.6**
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	68	(42 - 110)
Terphenyl-d14	75	(37 - 137)
2-Fluorobiphenyl	76	(43 - 110)
2-Fluorophenol	50	(11 - 116)
Phenol-d5	51	(25 - 115)
2,4,6-Tribromophenol	76	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

lw
12/7/10

2

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-B

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-002
Date Sampled...: 10/05/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313050
Dilution Factor: 2.4
% Moisture.....: 80

Work Order #...: L78R11AH
Date Received..: 10/07/10
Analysis Date..: 11/16/10
Analysis Time..: 14:55
Initial Wgt/Vol: 25 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313028
Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	**4.5 J**	**16**	**ug/kg**	**2.5**
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(42 - 110)
Terphenyl-d14	42	(37 - 137)
2-Fluorobiphenyl	74	(43 - 110)
2-Fluorophenol	66	(11 - 116)
Phenol-d5	60	(25 - 115)
2,4,6-Tribromophenol	82	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-C

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-003
Date Sampled...: 10/05/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313050
Dilution Factor: 2.4
% Moisture.....: 77

Work Order #...: L78R21AH
Date Received..: 10/07/10
Analysis Date..: 11/16/10
Analysis Time..: 15:15
Initial Wgt/Vol: 25.2 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313028

Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	ND	16	ug/kg	2.5
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	56	(42 - 110)
Terphenyl-d14	58	(37 - 137)
2-Fluorobiphenyl	60	(43 - 110)
2-Fluorophenol	60	(11 - 116)
Phenol-d5	52	(25 - 115)
2,4,6-Tribromophenol	68	(35 - 116)

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-D

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-004
Date Sampled...: 10/05/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313050
Dilution Factor: 2.4
% Moisture.....: 77

Work Order #...: L78R31AH
Date Received..: 10/07/10
Analysis Date..: 11/16/10
Analysis Time..: 15:35
Initial Wgt/Vol: 25 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313028

Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	ND	16	ug/kg	1.7
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	ND	16	ug/kg	1.4
Phenanthrene	**5.6 J**	**16**	**ug/kg**	**2.5**
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	62	(42 - 110)
Terphenyl-d14	62	(37 - 137)
2-Fluorobiphenyl	68	(43 - 110)
2-Fluorophenol	68	(11 - 116)
Phenol-d5	59	(25 - 115)
2,4,6-Tribromophenol	79	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MT-E

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-005 **Work Order #...:** L78R41AH **Matrix.....:** BIOLOGIC
Date Sampled...: 10/05/10 **Date Received..:** 10/07/10 **MS Run #.....:** 0313028
Prep Date.....: 11/09/10 **Analysis Date..:** 11/16/10
Prep Batch #...: 0313050 **Analysis Time..:** 15:55
Dilution Factor: 3 **Initial Wgt/Vol:** 20 g **Final Wgt/Vol..:** 0.5 mL
% Moisture.....: 78 **Analyst ID.....:** 007062 **Instrument ID..:** 722
Method.....: SW846 8270C

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	20	ug/kg	1.9
Acenaphthylene	ND	20	ug/kg	2.3
Anthracene	ND	20	ug/kg	2.0
Benzo(a)anthracene	ND	20	ug/kg	2.5
Benzo(b)fluoranthene	ND	20	ug/kg	3.1
Benzo(k)fluoranthene	ND	20	ug/kg	4.0
Benzo(ghi)perylene	ND	20	ug/kg	2.0
Benzo(a)pyrene	ND	20	ug/kg	2.0
Chrysene	ND	20	ug/kg	2.4
Dibenz(a,h)anthracene	ND	20	ug/kg	2.2
Fluoranthene	ND	20	ug/kg	2.1
Fluorene	ND	20	ug/kg	2.6
Indeno(1,2,3-cd)pyrene	ND	20	ug/kg	2.1
Naphthalene	ND	20	ug/kg	1.7
Phenanthrene	ND	20	ug/kg	3.2
Pyrene	ND	20	ug/kg	2.0
2-Methylnaphthalene	ND	20	ug/kg	1.8
1-Methylnaphthalene	ND	20	ug/kg	2.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	45	(42 - 110)
Terphenyl-d14	48	(37 - 137)
2-Fluorobiphenyl	52	(43 - 110)
2-Fluorophenol	52	(11 - 116)
Phenol-d5	44	(25 - 115)
2,4,6-Tribromophenol	58	(35 - 116)

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-006	**Work Order #...:**	L78R51AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	16:15		
Dilution Factor:	4	**Initial Wgt/Vol:**	15 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	79	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**7.8 J**	**27**	**ug/kg**	**2.6**
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	ND	27	ug/kg	2.3
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	**2.8 J**	**27**	**ug/kg**	**2.8**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	65	(42 - 110)
Terphenyl-d14	31 *	(37 - 137)
2-Fluorobiphenyl	72	(43 - 110)
2-Fluorophenol	67	(11 - 116)
Phenol-d5	65	(25 - 115)
2,4,6-Tribromophenol	81	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-007	**Work Order #...:**	L78R61AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	16:35		
Dilution Factor:	4	**Initial Wgt/Vol:**	15 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	83	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	27	ug/kg	2.6
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	**3.2 J**	**27**	**ug/kg**	**2.3**
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	59	(42 - 110)
Terphenyl-d14	24 *	(37 - 137)
2-Fluorobiphenyl	63	(43 - 110)
2-Fluorophenol	63	(11 - 116)
Phenol-d5	58	(25 - 115)
2,4,6-Tribromophenol	66	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-C

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-008	**Work Order #...:**	L78R71AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	16:55		
Dilution Factor:	3	**Initial Wgt/Vol:**	20 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	75	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	20	ug/kg	1.9
Acenaphthylene	ND	20	ug/kg	2.3
Anthracene	ND	20	ug/kg	2.0
Benzo(a)anthracene	ND	20	ug/kg	2.5
Benzo(b)fluoranthene	ND	20	ug/kg	3.1
Benzo(k)fluoranthene	ND	20	ug/kg	4.0
Benzo(ghi)perylene	ND	20	ug/kg	2.0
Benzo(a)pyrene	ND	20	ug/kg	2.0
Chrysene	ND	20	ug/kg	2.4
Dibenz(a,h)anthracene	ND	20	ug/kg	2.2
Fluoranthene	ND	20	ug/kg	2.1
Fluorene	ND	20	ug/kg	2.6
Indeno(1,2,3-cd)pyrene	ND	20	ug/kg	2.1
Naphthalene	ND	20	ug/kg	1.7
Phenanthrene	ND	20	ug/kg	3.2
Pyrene	ND	20	ug/kg	2.0
2-Methylnaphthalene	ND	20	ug/kg	1.8
1-Methylnaphthalene	ND	20	ug/kg	2.1

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	61	(42 - 110)
Terphenyl-d14	39	(37 - 137)
2-Fluorobiphenyl	66	(43 - 110)
2-Fluorophenol	62	(11 - 116)
Phenol-d5	59	(25 - 115)
2,4,6-Tribromophenol	66	(35 - 116)

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EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-009	**Work Order #...:**	L78R81AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/05/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	17:15		
Dilution Factor:	4	**Initial Wgt/Vol:**	15 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	77	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	27	ug/kg	2.6
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	**4.8 J**	**27**	**ug/kg**	**2.3**
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	76	(42 - 110)
Terphenyl-d14	31 *	(37 - 137)
2-Fluorobiphenyl	81	(43 - 110)
2-Fluorophenol	83	(11 - 116)
Phenol-d5	77	(25 - 115)
2,4,6-Tribromophenol	87	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

MW
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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-010	**Work Order #...:**	L78R91AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	17:36		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**5.1 J**	**16**	**ug/kg**	**1.5**
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	**4.1 J**	**16**	**ug/kg**	**1.6**
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	**14 ~~J~~ J**	**16**	**ug/kg**	**2.5**
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**39**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	**3.5 J**	**16**	**ug/kg**	**1.4**
Phenanthrene	**13 J**	**16**	**ug/kg**	**2.5**
Pyrene	**8.7 ~~J~~ J**	**16**	**ug/kg**	**1.6**
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	66	(42 - 110)
Terphenyl-d14	44	(37 - 137)
2-Fluorobiphenyl	75	(43 - 110)
2-Fluorophenol	82	(11 - 116)
Phenol-d5	53	(25 - 115)
2,4,6-Tribromophenol	75	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-011	**Work Order #...:**	L78TA1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	17:56		
Dilution Factor:	4	**Initial Wgt/Vol:**	15 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	77	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	27	ug/kg	2.6
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	ND	27	ug/kg	2.3
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	61	(42 - 110)
Terphenyl-d14	53	(37 - 137)
2-Fluorobiphenyl	70	(43 - 110)
2-Fluorophenol	69	(11 - 116)
Phenol-d5	62	(25 - 115)
2,4,6-Tribromophenol	79	(35 - 116)

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-C

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-012	**Work Order #...:**	L78TC1AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	18:16		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**7.0 J**	**16**	**ug/kg**	**1.5**
Acenaphthylene	ND	16	ug/kg	1.8
Anthracene	ND	16	ug/kg	1.6
Benzo(a)anthracene	ND	16	ug/kg	2.0
Benzo(b)fluoranthene	ND	16	ug/kg	2.5
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	ND	16	ug/kg	1.9
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**8.8 J**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	**5.3 J**	**16**	**ug/kg**	**1.4**
Phenanthrene	**4.2 J**	**16**	**ug/kg**	**2.5**
Pyrene	ND	16	ug/kg	1.6
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	60	(42 - 110)
Terphenyl-d14	59	(37 - 137)
2-Fluorobiphenyl	68	(43 - 110)
2-Fluorophenol	60	(11 - 116)
Phenol-d5	55	(25 - 115)
2,4,6-Tribromophenol	70	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-D

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-013
Date Sampled...: 10/04/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313050
Dilution Factor: 4
% Moisture.....: 76

Work Order #...: L78TD1AN
Date Received..: 10/07/10
Analysis Date..: 11/16/10
Analysis Time..: 18:36
Initial Wgt/Vol: 15 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313028
Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	27	ug/kg	2.6
Acenaphthylene	ND	27	ug/kg	3.1
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	ND	27	ug/kg	2.9
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	**6.1 J**	**27**	**ug/kg**	**2.3**
Phenanthrene	ND	27	ug/kg	4.2
Pyrene	ND	27	ug/kg	2.7
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	48	(42 - 110)
Terphenyl-d14	28 *	(37 - 137)
2-Fluorobiphenyl	54	(43 - 110)
2-Fluorophenol	53	(11 - 116)
Phenol-d5	49	(25 - 115)
2,4,6-Tribromophenol	55	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

MW 12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MT-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-014	**Work Order #...:**	L78TE1CR	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	18:57		
Dilution Factor:	2.4	**Initial Wgt/Vol:**	25 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	77	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	16	ug/kg	1.5
Acenaphthylene	**3.4 J**	**16**	**ug/kg**	**1.8**
Anthracene	**9.0 J**	**16**	**ug/kg**	**1.6**
Benzo(a)anthracene	**27 J**	**16**	**ug/kg**	**2.0**
Benzo(b)fluoranthene	**21 J**	**16**	**ug/kg**	**2.5**
Benzo(k)fluoranthene	ND	16	ug/kg	3.2
Benzo(ghi)perylene	ND	16	ug/kg	1.6
Benzo(a)pyrene	ND	16	ug/kg	1.6
Chrysene	**11 ~~J~~ J**	**16**	**ug/kg**	**1.9**
Dibenz(a,h)anthracene	ND	16	ug/kg	1.8
Fluoranthene	**61**	**16**	**ug/kg**	**1.7**
Fluorene	ND	16	ug/kg	2.1
Indeno(1,2,3-cd)pyrene	ND	16	ug/kg	1.6
Naphthalene	~~ND~~ UL	16	ug/kg	1.4
Phenanthrene	**6.3 J**	**16**	**ug/kg**	**2.5**
Pyrene	**33 J**	**16**	**ug/kg**	**1.6**
2-Methylnaphthalene	ND	16	ug/kg	1.4
1-Methylnaphthalene	ND	16	ug/kg	1.7

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	51	(42 - 110)
Terphenyl-d14	42	(37 - 137)
2-Fluorobiphenyl	58	(43 - 110)
2-Fluorophenol	54	(11 - 116)
Phenol-d5	50	(25 - 115)
2,4,6-Tribromophenol	59	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-A

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-015	**Work Order #...:**	L78TF1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	19:17		
Dilution Factor:	6	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**16 ~~J~~ L**	**40**	**ug/kg**	**3.8**
Acenaphthylene	ND R	40	ug/kg	4.6
Anthracene	ND	40	ug/kg	3.9
Benzo(a)anthracene	ND	40	ug/kg	5.0
Benzo(b)fluoranthene	ND	40	ug/kg	6.3
Benzo(k)fluoranthene	ND	40	ug/kg	8.1
Benzo(ghi)perylene	ND	40	ug/kg	4.0
Benzo(a)pyrene	ND	40	ug/kg	4.0
Chrysene	ND	40	ug/kg	4.8
Dibenz(a,h)anthracene	ND	40	ug/kg	4.5
Fluoranthene	ND	40	ug/kg	4.3
Fluorene	ND	40	ug/kg	5.3
Indeno(1,2,3-cd)pyrene	ND	40	ug/kg	4.1
Naphthalene	**27 ~~J~~ L**	**40**	**ug/kg**	**3.4**
Phenanthrene	ND R	40	ug/kg	6.4
Pyrene	ND	40	ug/kg	4.0
2-Methylnaphthalene	ND	40	ug/kg	3.6
1-Methylnaphthalene	ND	40	ug/kg	4.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	70	(42 - 110)
Terphenyl-d14	2.2 *	(37 - 137)
2-Fluorobiphenyl	69	(43 - 110)
2-Fluorophenol	74	(11 - 116)
Phenol-d5	75	(25 - 115)
2,4,6-Tribromophenol	30 *	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

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EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-B

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-016	**Work Order #...:**	L78TG1AH	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	19:37		
Dilution Factor:	6	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**12 J**	**40**	**ug/kg**	**3.8**
Acenaphthylene	**7.4 J**	**40**	**ug/kg**	**4.6**
Anthracene	ND	40	ug/kg	3.9
Benzo(a)anthracene	ND	40	ug/kg	5.0
Benzo(b)fluoranthene	ND	40	ug/kg	6.3
Benzo(k)fluoranthene	ND	40	ug/kg	8.1
Benzo(ghi)perylene	ND	40	ug/kg	4.0
Benzo(a)pyrene	ND	40	ug/kg	4.0
Chrysene	ND	40	ug/kg	4.8
Dibenz(a,h)anthracene	ND	40	ug/kg	4.5
Fluoranthene	**68**	**40**	**ug/kg**	**4.3**
Fluorene	ND	40	ug/kg	5.3
Indeno(1,2,3-cd)pyrene	ND	40	ug/kg	4.1
Naphthalene	**23 J**	**40**	**ug/kg**	**3.4**
Phenanthrene	ND	40	ug/kg	6.4
Pyrene	**36 ~~J~~**	**40**	**ug/kg**	**4.0**
2-Methylnaphthalene	ND	40	ug/kg	3.6
1-Methylnaphthalene	ND	40	ug/kg	4.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	50	(42 - 110)
Terphenyl-d14	41	(37 - 137)
2-Fluorobiphenyl	53	(43 - 110)
2-Fluorophenol	51	(11 - 116)
Phenol-d5	54	(25 - 115)
2,4,6-Tribromophenol	54	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

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Client Sample ID: CP-CASA-MU-C

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-017	**Work Order #...:**	L78TH1AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	20:38		
Dilution Factor:	6	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	75	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**33 J**	**40**	**ug/kg**	**3.8**
Acenaphthylene	**10 J**	**40**	**ug/kg**	**4.6**
Anthracene	**8.4 J**	**40**	**ug/kg**	**3.9**
Benzo(a)anthracene	ND	40	ug/kg	5.0
Benzo(b)fluoranthene	**25 ~~J~~ J**	**40**	**ug/kg**	**6.3**
Benzo(k)fluoranthene	**21 ~~J~~ J**	**40**	**ug/kg**	**8.1**
Benzo(ghi)perylene	ND	40	ug/kg	4.0
Benzo(a)pyrene	**26 ~~J~~ J**	**40**	**ug/kg**	**4.0**
Chrysene	ND	40	ug/kg	4.8
Dibenz(a,h)anthracene	ND	40	ug/kg	4.5
Fluoranthene	**170**	**40**	**ug/kg**	**4.3**
Fluorene	**8.3 J**	**40**	**ug/kg**	**5.3**
Indeno(1,2,3-cd)pyrene	ND	40	ug/kg	4.1
Naphthalene	**59**	**40**	**ug/kg**	**3.4**
Phenanthrene	**21 J**	**40**	**ug/kg**	**6.4**
Pyrene	**88 J**	**40**	**ug/kg**	**4.0**
2-Methylnaphthalene	**7.6 J**	**40**	**ug/kg**	**3.6**
1-Methylnaphthalene	ND	40	ug/kg	4.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	59	(42 - 110)
Terphenyl-d14	46	(37 - 137)
2-Fluorobiphenyl	66	(43 - 110)
2-Fluorophenol	59	(11 - 116)
Phenol-d5	56	(25 - 115)
2,4,6-Tribromophenol	63	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

kw
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-018	**Work Order #...:**	L78TJ1AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	20:59		
Dilution Factor:	4	**Initial Wgt/Vol:**	15 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	74	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**23 J**	**27**	**ug/kg**	**2.6**
Acenaphthylene	**9.1 J**	**27**	**ug/kg**	**3.1**
Anthracene	ND	27	ug/kg	2.6
Benzo(a)anthracene	ND	27	ug/kg	3.3
Benzo(b)fluoranthene	ND	27	ug/kg	4.2
Benzo(k)fluoranthene	ND	27	ug/kg	5.4
Benzo(ghi)perylene	ND	27	ug/kg	2.7
Benzo(a)pyrene	ND	27	ug/kg	2.7
Chrysene	ND	27	ug/kg	3.2
Dibenz(a,h)anthracene	ND	27	ug/kg	3.0
Fluoranthene	**95**	**27**	**ug/kg**	**2.9**
Fluorene	ND	27	ug/kg	3.5
Indeno(1,2,3-cd)pyrene	ND	27	ug/kg	2.7
Naphthalene	**26 J**	**27**	**ug/kg**	**2.3**
Phenanthrene	**19 J**	**27**	**ug/kg**	**4.2**
Pyrene	**32**	**27**	**ug/kg**	**2.7**
2-Methylnaphthalene	ND	27	ug/kg	2.4
1-Methylnaphthalene	ND	27	ug/kg	2.8

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	50	(42 - 110)
Terphenyl-d14	32 *	(37 - 137)
2-Fluorobiphenyl	52	(43 - 110)
2-Fluorophenol	58	(11 - 116)
Phenol-d5	45	(25 - 115)
2,4,6-Tribromophenol	51	(35 - 116)

NOTE(S):

* Surrogate recovery is outside stated control limits.

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: CP-CASA-MU-E

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-019	**Work Order #...:**	L78TK1AN	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/04/10	**Date Received..:**	10/07/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	21:19		
Dilution Factor:	6	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	77	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	**31 J**	**40**	**ug/kg**	**3.8**
Acenaphthylene	**21 J**	**40**	**ug/kg**	**4.6**
Anthracene	**15 J**	**40**	**ug/kg**	**3.9**
Benzo(a)anthracene	ND	40	ug/kg	5.0
Benzo(b)fluoranthene	**77 J**	**40**	**ug/kg**	**6.3**
Benzo(k)fluoranthene	ND	40	ug/kg	8.1
Benzo(ghi)perylene	ND	40	ug/kg	4.0
Benzo(a)pyrene	ND	40	ug/kg	4.0
Chrysene	ND	40	ug/kg	4.8
Dibenz(a,h)anthracene	ND	40	ug/kg	4.5
Fluoranthene	**200**	**40**	**ug/kg**	**4.3**
Fluorene	**9.4 J**	**40**	**ug/kg**	**5.3**
Indeno(1,2,3-cd)pyrene	ND	40	ug/kg	4.1
Naphthalene	**58**	**40**	**ug/kg**	**3.4**
Phenanthrene	**29 J**	**40**	**ug/kg**	**6.4**
Pyrene	**110 J**	**40**	**ug/kg**	**4.0**
2-Methylnaphthalene	**15 J**	**40**	**ug/kg**	**3.6**
1-Methylnaphthalene	ND	40	ug/kg	4.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	60	(42 - 110)
Terphenyl-d14	48	(37 - 137)
2-Fluorobiphenyl	67	(43 - 110)
2-Fluorophenol	66	(11 - 116)
Phenol-d5	66	(25 - 115)
2,4,6-Tribromophenol	62	(35 - 116)

NOTE(S):

J Estimated result. Result is less than RL.

NW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: SRM

GC/MS Semivolatiles

Lot-Sample #...: C0J090480-020
Date Sampled...: 10/04/10
Prep Date.....: 11/09/10
Prep Batch #...: 0313050
Dilution Factor: 12
% Moisture.....:

Work Order #...: L787N1AA
Date Received..: 10/07/10
Analysis Date..: 11/18/10
Analysis Time..: 00:06
Initial Wgt/Vol: 5 g
Analyst ID.....: 007062
Method.....: SW846 8270C

Matrix.....: BIOLOGIC
MS Run #.....: 0313028

Final Wgt/Vol..: 0.5 mL
Instrument ID..: 722

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	80	ug/kg	7.7
Acenaphthylene	ND	80	ug/kg	9.2
Anthracene	ND	80	ug/kg	7.8
Benzo(a)anthracene	ND	80	ug/kg	10
Benzo(b)fluoranthene	ND	80	ug/kg	13
Benzo(k)fluoranthene	ND	80	ug/kg	16
Benzo(ghi)perylene	ND	80	ug/kg	8.0
Benzo(a)pyrene	ND	80	ug/kg	8.0
Chrysene	ND	80	ug/kg	9.5
Dibenz(a,h)anthracene	ND	80	ug/kg	8.9
Fluoranthene	ND	80	ug/kg	8.6
Fluorene	ND	80	ug/kg	11
Indeno(1,2,3-cd)pyrene	ND	80	ug/kg	8.2
Naphthalene	ND	80	ug/kg	6.9
Phenanthrene	ND	80	ug/kg	13
Pyrene	ND	80	ug/kg	8.1
2-Methylnaphthalene	ND	80	ug/kg	7.2
1-Methylnaphthalene	ND	80	ug/kg	8.5

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	49	(42 - 110)
Terphenyl-d14	51	(37 - 137)
2-Fluorobiphenyl	48	(43 - 110)
2-Fluorophenol	50	(11 - 116)
Phenol-d5	52	(25 - 115)
2,4,6-Tribromophenol	53	(35 - 116)

MW
12/7/10

EA Engineering, Science and Technology

Client Sample ID: PR-CASA-MU-D

GC/MS Semivolatiles

Lot-Sample #...:	C0J090480-021	**Work Order #...:**	L8CAK1AM	**Matrix.....:**	BIOLOGIC
Date Sampled...:	10/11/10	**Date Received..:**	10/12/10	**MS Run #.....:**	0313028
Prep Date.....:	11/09/10	**Analysis Date..:**	11/16/10		
Prep Batch #...:	0313050	**Analysis Time..:**	22:41		
Dilution Factor:	6	**Initial Wgt/Vol:**	10 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	73	**Analyst ID.....:**	007062	**Instrument ID..:**	722
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Acenaphthene	ND	40	ug/kg	3.8
Acenaphthylene	ND	40	ug/kg	4.6
Anthracene	ND	40	ug/kg	3.9
Benzo(a)anthracene	ND	40	ug/kg	5.0
Benzo(b)fluoranthene	ND	40	ug/kg	6.3
Benzo(k)fluoranthene	ND	40	ug/kg	8.1
Benzo(ghi)perylene	ND	40	ug/kg	4.0
Benzo(a)pyrene	ND	40	ug/kg	4.0
Chrysene	ND	40	ug/kg	4.8
Dibenz(a,h)anthracene	ND	40	ug/kg	4.5
Fluoranthene	ND	40	ug/kg	4.3
Fluorene	ND	40	ug/kg	5.3
Indeno(1,2,3-cd)pyrene	ND	40	ug/kg	4.1
Naphthalene	ND	40	ug/kg	3.4
Phenanthrene	ND	40	ug/kg	6.4
Pyrene	ND	40	ug/kg	4.0
2-Methylnaphthalene	ND	40	ug/kg	3.6
1-Methylnaphthalene	ND	40	ug/kg	4.3

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Nitrobenzene-d5	65	(42 - 110)
Terphenyl-d14	39	(37 - 137)
2-Fluorobiphenyl	72	(43 - 110)
2-Fluorophenol	64	(11 - 116)
Phenol-d5	61	(25 - 115)
2,4,6-Tribromophenol	65	(35 - 116)

NW
12/7/10

APPENDIX H:

ATTACHMENT D

ARSENIC SPECIATION DATA REPORTS

Report of Biota Analyses Arsenic Speciation

Project: Sparrows Point
Samples Collected: October 4-5, 2010
Report Date: December 15, 2010

Prepared for:
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Case Narrative

Shipping and Receiving

On October 21, 2010, Brooks Rand Labs (BRL) received eight biota samples at 9:00 A.M. in a cooler with wet ice at a temperature of 3.0 °C. The sample matrix on the chain-of-custody (COC) form listed the sample matrix as *MARINE\SEDIMENT*. The client was contacted and confirmed that the sample matrix was biota. Samples were homogenized prior to arriving at BRL. The COC forms requested arsenic speciation analysis of the samples, contractually defined as trivalent arsenic [As(III)], inorganic arsenic [As(Inorg)], and pentavalent arsenic [As(V)], monomethylarsonic acid (MMAs), and dimethylarsinic acid (DMAs). The samples were received and stored securely according to BRL standard operating procedures (SOP) and EPA methodology. Results have been reported on a wet-weight basis.

Preservation and Holding Time

All method and SOP requirements for preservation and holding time were satisfied.

Inorganic Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M hydrochloric acid (HCl) and heated for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) sodium borohydride ($NaBH_4$) solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine (AsH_3) to be desorbed is represents total inorganic As in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

Sequence 1000930

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

Batch B101954

All sample results are reported without qualification and all quality control sample results met the acceptance criteria.

Trivalent Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, the samples are extracted with 0.5 M phosphoric acid (H_3PO_4) and 0.1 M hydroxylamine hydrochloride ($NH_2OH{\cdot}HCl$), tumbled for one hour, and then centrifuged for 20 - 30 minutes. An aliquot of tissue digestate is diluted to final volume with a 0.5% (v/v) HCl

solution, the pH is adjusted with a 2% (m/v) potassium hydroxide (KOH) solution, and 2.5 M trishydrochloride buffer is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine to be desorbed is AsH_3, which represents As(III) in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

Sequence 1000936

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The analysis of the highest calibration standard (1000936-CAL5) produced a low recovery and was omitted from the calibration curve. All sample results were well below the highest calibration standard concentration; therefore, no further corrective action was required.

Batch B101948

The analysis of the blank spike (B101948-BS2) yielded a low recovery of 42%. The reanalysis of this sample confirmed the initial result. Consequently, the As(III) results for all samples were qualified **J** and should be considered estimates. However, the MS/MSD recoveries for As(III) were within the acceptance criteria (at 73% and 80%), and these recoveries are considered a more applicable measure of method performance.

All sample results are reported without further qualification and all other quality control sample results met the acceptance criteria.

Pentavalent Arsenic in Biota by Calculation

The concentration of As(V) found in a sample is determined by subtracting the result of the analysis of As(III) from the result of the analysis of As(Inorg). The MDL and MRL for As(V) are equal to the MDL and MRL for As(III) or As(Inorg), whichever is greater.

Due to qualification of the associated As(III) results from batch B101948, the results for As(V) were also qualified **J** and should be considered estimates. All sample results are reported without further qualification.

DMAs & MMAs in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M sodium hydroxide (NaOH) and heated at 80 °C for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

DMA Sequence 1000946

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The initial calibration verification (ICV) standard yielded a recovery outside the acceptance criteria. This standard was reprepared and reanalyzed, and an acceptable recovery was achieved (reported at 1000946-ICV2).

The analysis of the lowest calibration standard (1000946-CAL1) produced a recovery outside of the acceptance criteria and was omitted from the calibration curve. As the next lowest calibration standard has a concentration below the calculated MRL, no further corrective action was required.

The continuing calibration verification (CCV) standards identified as 1000946-CCV4, -CCV5, and -CCV6 produced recoveries below the control limits (at 56% - 68%). With the exception of sample *CP-CASA-MT-A* (1044008-05), all sample analyses for this work order were bracketed by these CCVs and, thus, were reported qualified **J** and should be considered estimates. Re-analysis within the holding time for the sample preparations was not possible, and limited sample mass made reanalysis impossible.

Many samples in this sequence produced abnormal peak shapes with either a double peak or a long tailing edge. Some of the tailing was not smooth and it is not clear if this is the result of peak interference or not. Double peaks were integrated as one peak and a comparison of the double peaks to a duplicate analysis that produced a single peak confirmed the validity of this approach. Long tails were generally integrated to approximately 1 minute of retention time, as this is the end of the tailing seen in the calibration standards.

DMA Batch B101950

The method blanks (BLKs) reported as B101950-BLK3 and B101950-BLK4 are identified as B101955-BLK3 and B101955-BLK4 in the raw data. Blank were shared between these batches, as they were prepared together.

The MS/MSD set prepared on sample *CP-CASA-MT-A* (1044008-05), identified as B101950-MS1/MSD1, was spiked at a concentration that was less than the native sample result; therefore, the recovery criterion does not apply. A post-preparation spike (B101950-PS3) was prepared and analyzed at an appropriate spiking level, and the recovery met the acceptance criteria.

MMA Sequence 1000949

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

MMA Batch B101951

The method blanks (BLKs) reported as B101951-BLK3 and B101951-BLK4 are identified as B101956-BLK3 and B101956-BLK4 in the raw data. Blank were shared between these batches, as they were prepared together.

In instances when the native sample and/or the corresponding DUP produce non-detectable results, the RPD is not calculated (**N/C**).

All results were at or below the associated MDL, and are, therefore, reported at the MDL and qualified **U**. All data was reported without further qualification and all associated quality control sample results met the acceptance criteria.

We certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. BRL, an accredited laboratory, certifies that the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more details, please see the *Report Information* page in your report. Please feel free to contact us if you have any questions regarding this report.

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Report Information

Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

BLK	method blank	**MS**	matrix spike
BRL	Brooks Rand Labs	**MSD**	matrix spike duplicate
BS	laboratory fortified blank	**ND**	non-detect
CAL	calibration standard	**NR**	non-reportable
CCV	continuing calibration verification	**PS**	post preparation spike
COC	chain of custody record	**REC**	percent recovery
CRM	certified reference material	**RPD**	relative percent difference
D	dissolved fraction	**RSD**	relative standard deviation
DUP	duplicate	**SCV**	secondary calibration verification
ICV	initial calibration verification	**SOP**	standard operating procedure
MDL	method detection limit	**SRM**	standard reference material
MRL	method reporting limit	**T**	total recoverable fraction

Definition of Data Qualifiers

(Effective 9/23/09)

B Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H Holding time and/or preservation requirements not met. Result is estimated.
J Estimated value. A full explanation is presented in the narrative.
J-M Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
J-N Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
M Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
N Spike recovery was not within acceptance criteria. Result is estimated.
R Rejected, unusable value. A full explanation is presented in the narrative.
U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch.
Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand, Ltd., those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; USEPA; July 2002. These supersede all previous qualifiers ever employed by BRL.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
PR-CASA-MT-A	1044008-01	Biota	Sample	10/05/2010	10/21/2010
PR-CASA-MT-B	1044008-02	Biota	Sample	10/05/2010	10/21/2010
PR-CASA-MU-A	1044008-03	Biota	Sample	10/05/2010	10/21/2010
PR-CASA-MU-B	1044008-04	Biota	Sample	10/05/2010	10/21/2010
CP-CASA-MT-A	1044008-05	Biota	Sample	10/04/2010	10/21/2010
CP-CASA-MT-B	1044008-06	Biota	Sample	10/04/2010	10/21/2010
CP-CASA-MU-A	1044008-07	Biota	Sample	10/04/2010	10/21/2010
CP-CASA-MU-B	1044008-08	Biota	Sample	10/04/2010	10/21/2010

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
As(III)	Biota	EPA Method 1632	12/02/2010	12/03/2010	B101948	1000936
As(Inorg)	Biota	EPA Method 1632 mod.	12/01/2010	12/02/2010	B101954	1000930
DMAs	Biota	EPA Method 1632	12/05/2010	12/06/2010	B101950	1000946
MMAs	Biota	EPA Method 1632	12/05/2010	12/06/2010	B101951	1000949

ENVIRONMENTAL
Data Services, Inc.

ARSENIC SPECIATION

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: 1044008

Client: Maryland Environmental Service, Millersville, MD Date: December 17, 2010

Laboratory: Brooks Rand Labs, Seattle, WA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-CASA-MT-A	1044008-01	Tissue
1MS	PR-CASA-MT-AMS	1044008-01MS	Tissue
1MSD	PR-CASA-MT-AMSD	1044008-01MSD	Tissue
2	PR-CASA-MT-B	1044008-02	Tissue
3	PR-CASA-MU-A	1044008-03	Tissue
4	PR-CASA-MU-B	1044008-04	Tissue
5	CP-CASA-MT-A	1044008-05	Tissue
5MS	CP-CASA-MT-AMS	1044008-05MS	Tissue
5MSD	CP-CASA-MT-AMSD	1044008-05MSD	Tissue
6	CP-CASA-MT-B	1044008-06	Tissue
7	CP-CASA-MU-A	1044008-07	Tissue
8	CP-CASA-MU-B	1044008-08	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 180 days for arsenic.

Calibration - The ICV and CCV %R values were acceptable with the exception of the following.

CCV	Compound	%R	Qualifier	Affected Samples
CCV4	DMAs	63%	J/UJ	1-4, 6-8
CCV5	DMAs	56%	J/UJ	
CCV6	DMAs	68%	J/UJ	

Method and Calibration Blanks - All results were method blank corrected per the calculations section of the applicable SOP for this method.

Field and Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - The MS/MSD samples exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
5	DMAs	OK/182%/OK	None	4X Rule applies- No action required

LCS - The LCS samples exhibited acceptable %R values except the following.

LCS ID	Compound	%R	Qualifier	Affected Samples
B101948-BS2	As(III)	42%	L/UL	All samples

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - The concentration of As(V) found in a sample is determined by subtracting the result of the As(III) analysis from the result of the As(Inorg) analysis. Since the As(III) results were qualified (L) due to a low LCS %R value, the results for As(V) were also qualified (L).

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
CP-CASA-MT-A											
1044008-05	As(III)	Biota	N/A	0.015	L J	0.003	0.009	mg/kg	B101948	1000936	5
1044008-05	As(Inorg)	Biota	N/A	0.019		0.003	0.009	mg/kg	B101954	1000930	
1044008-05	As(V)	Biota	N/A	0.003	L J	0.003	0.009	mg/kg	[CALC]	N/A	
1044008-05	DMAs	Biota	N/A	0.123		0.006	0.019	mg/kg	B101950	1000946	
1044008-05	MMAs	Biota	N/A	0.005	U	0.005	0.014	mg/kg	B101951	1000949	
CP-CASA-MT-B											
1044008-06	As(III)	Biota	N/A	0.015	L J	0.003	0.009	mg/kg	B101948	1000936	6
1044008-06	As(Inorg)	Biota	N/A	0.021		0.003	0.009	mg/kg	B101954	1000930	
1044008-06	As(V)	Biota	N/A	0.003	L J	0.003	0.009	mg/kg	[CALC]	N/A	
1044008-06	DMAs	Biota	N/A	0.140	J J	0.006	0.019	mg/kg	B101950	1000946	
1044008-06	MMAs	Biota	N/A	0.009	U	0.009	0.028	mg/kg	B101951	1000949	
CP-CASA-MU-A											
1044008-07	As(III)	Biota	N/A	0.039	L J	0.003	0.009	mg/kg	B101948	1000936	7
1044008-07	As(Inorg)	Biota	N/A	0.065		0.003	0.010	mg/kg	B101954	1000930	
1044008-07	As(V)	Biota	N/A	0.026	L J	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-07	DMAs	Biota	N/A	0.611	J J	0.014	0.046	mg/kg	B101950	1000946	
1044008-07	MMAs	Biota	N/A	0.023	U	0.023	0.068	mg/kg	B101951	1000949	
CP-CASA-MU-B											
1044008-08	As(III)	Biota	N/A	0.032	L J	0.003	0.010	mg/kg	B101948	1000936	8
1044008-08	As(Inorg)	Biota	N/A	0.060		0.003	0.010	mg/kg	B101954	1000930	
1044008-08	As(V)	Biota	N/A	0.027	L J	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-08	DMAs	Biota	N/A	0.728	J J	0.014	0.048	mg/kg	B101950	1000946	
1044008-08	MMAs	Biota	N/A	0.024	U	0.024	0.071	mg/kg	B101951	1000949	
PR-CASA-MT-A											
1044008-01	As(III)	Biota	N/A	0.022	L J	0.003	0.009	mg/kg	B101948	1000936	1
1044008-01	As(Inorg)	Biota	N/A	0.026		0.003	0.010	mg/kg	B101954	1000930	
1044008-01	As(V)	Biota	N/A	0.003	L J	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-01	DMAs	Biota	N/A	0.238	J J	0.006	0.019	mg/kg	B101950	1000946	
1044008-01	MMAs	Biota	N/A	0.009	U	0.009	0.028	mg/kg	B101951	1000949	

MW
12/17/10

Project ID: TST-PI1001
PM: Amanda Fawley

BROOKS RAND LABS
MEANINGFUL METALS DATA

BRL Report 1044008
Client PM: Carrie Gamber
Client PO: C0J090480

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
PR-CASA-MT-B											
1044008-02	As(III)	Biota	N/A	0.015	L ~~J~~	0.003	0.009	mg/kg	B101948	1000936	
1044008-02	As(Inorg)	Biota	N/A	0.018		0.003	0.010	mg/kg	B101954	1000930	2
1044008-02	As(V)	Biota	N/A	0.003	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-02	DMAs	Biota	N/A	0.179	J ~~J~~	0.005	0.018	mg/kg	B101950	1000946	
1044008-02	MMAs	Biota	N/A	0.009	U	0.009	0.027	mg/kg	B101951	1000949	
PR-CASA-MU-A											
1044008-03	As(III)	Biota	N/A	0.030	L ~~J~~	0.003	0.010	mg/kg	B101948	1000936	
1044008-03	As(Inorg)	Biota	N/A	0.047		0.003	0.010	mg/kg	B101954	1000930	3
1044008-03	As(V)	Biota	N/A	0.017	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-03	DMAs	Biota	N/A	0.635	J ~~J~~	0.014	0.048	mg/kg	B101950	1000946	
1044008-03	MMAs	Biota	N/A	0.024	U	0.024	0.072	mg/kg	B101951	1000949	
PR-CASA-MU-B											
1044008-04	As(III)	Biota	N/A	0.035	L ~~J~~	0.003	0.010	mg/kg	B101948	1000936	
1044008-04	As(Inorg)	Biota	N/A	0.048		0.003	0.010	mg/kg	B101954	1000930	4
1044008-04	As(V)	Biota	N/A	0.014	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044008-04	DMAs	Biota	N/A	0.461	J ~~J~~	0.005	0.018	mg/kg	B101950	1000946	
1044008-04	MMAs	Biota	N/A	0.009	U	0.009	0.027	mg/kg	B101951	1000949	

MW 12/17/10

Report of Biota Analyses Arsenic Speciation

Project: Sparrows Point
Samples Collected: October 1, 2010
Report Date: December 15, 2010

Prepared for:
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Case Narrative

Shipping and Receiving

On October 21, 2010, Brooks Rand Labs (BRL) received eight biota samples at 9:00 A.M. in a cooler with wet ice at a temperature of 3.0 °C. The sample matrix on the chain-of-custody (COC) form listed the sample matrix as *MARINE\SEDIMENT*. The client was contacted and confirmed that the sample matrix was biota. Samples were homogenized prior to arriving at BRL. The COC forms requested arsenic speciation analysis of the samples, contractually defined as trivalent arsenic [As(III)], inorganic arsenic [As(Inorg)], and pentavalent arsenic [As(V)], monomethylarsonic acid (MMAs), and dimethylarsinic acid (DMAs). The samples were received and stored securely according to BRL standard operating procedures (SOP) and EPA methodology. Results have been reported on a wet-weight basis.

Preservation and Holding Time

All method and SOP requirements for preservation and holding time were satisfied.

Inorganic Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M hydrochloric acid (HCl) and heated for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) sodium borohydride ($NaBH_4$) solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine (AsH_3) to be desorbed is represents total inorganic As in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

Sequence 1000930

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

Batch B101954

All sample results are reported without qualification and all quality control sample results met the acceptance criteria.

Trivalent Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, the samples are extracted with 0.5 M phosphoric acid (H_3PO_4) and 0.1 M hydroxylamine hydrochloride ($NH_2OH{\cdot}HCl$), tumbled for one hour, and then centrifuged for 20 - 30 minutes. An aliquot of tissue digestate is diluted to final volume with a 0.5% (v/v) HCl

solution, the pH is adjusted with a 2% (m/v) potassium hydroxide (KOH) solution, and 2.5 M trishydrochloride buffer is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine to be desorbed is AsH_3, which represents As(III) in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

Sequence 1000936

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The analysis of the highest calibration standard (1000936-CAL5) produced a low recovery and was omitted from the calibration curve. All sample results were well below the highest calibration standard concentration; therefore, no further corrective action was required.

Batch B101948

The analysis of the blank spike (B101948-BS2) yielded a low recovery of 42%. The reanalysis of this sample confirmed the initial result. Consequently, the As(III) results for all samples were qualified **J** and should be considered estimates. However, the matrix spike and matrix spike duplicate (MS/MSD) recoveries for As(III) were within the acceptance criteria (at 67% and 84%), and these recoveries are considered a more applicable measure of method performance.

Due to limited sample mass, only a MS (B101948-MS2) could be prepared from sample CP-MOAM-FT-A (1044009-07). Therefore, a full MS/MSD set was prepared from sample CP-MOAM-FT-B (1044009-08).

All sample results are reported without further qualification and all other quality control sample results met the acceptance criteria.

Pentavalent Arsenic in Biota by Calculation

The concentration of As(V) found in a sample is determined by subtracting the result of the analysis of As(III) from the result of the analysis of As(Inorg). The MDL and MRL for As(V) are equal to the MDL and MRL for As(III) or As(Inorg), whichever is greater.

Due to qualification of the associated As(III) results from batch B101948, the results for As(V) were also qualified **J** and should be considered estimates. All sample results are reported without further qualification.

DMAs & MMAs in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M sodium hydroxide (NaOH) and heated at 80 °C for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

DMA Sequence 1000946

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The initial calibration verification (ICV) standard yielded a recovery outside the acceptance criteria. This standard was reprepared and reanalyzed, and an acceptable recovery was achieved (reported at 1000946-ICV2).

The analysis of the lowest calibration standard (1000946-CAL1) produced a recovery outside of the acceptance criteria and was omitted from the calibration curve. As the next lowest calibration standard has a concentration below the calculated MRL, no further corrective action was required.

The continuing calibration verification (CCV) standards identified as 1000946-CCV4, -CCV5, and -CCV6 produced recoveries below the control limits (at 56% - 68%). With the exception of sample *CP-MOAM-FT-A* (1044009-07), all sample analyses for this work order were bracketed by these CCVs and, thus, were reported qualified **J** and should be considered estimates. Re-analysis within the holding time for the sample preparations was not possible and limited sample mass made reanalysis impossible.

Many samples in this sequence produced abnormal peak shapes with either a double peak or a long tailing edge. Some of the tailing was not smooth and it is not clear if this is the result of peak interference or not. Double peaks were integrated as one peak and a comparison of the double peaks to a duplicate analysis that produced a single peak confirmed the validity of this approach. Long tails were generally integrated to approximately 1 minute of retention time, as this is the end of the tailing seen in the calibration standards.

DMA Batch B101955

The method blanks (BLKs) reported as B101950-BLK3 and B101950-BLK4 are identified as B101955-BLK3 and B101955-BLK4 in the raw data. Blanks were shared between these batches, as they were prepared together.

The MS/MSD set prepared on sample *CP-CASA-MT-A* (1044009-07) identified as B101955-MS1/MSD1 produced recoveries within the acceptance criteria when initially analyzed; however, were inadvertently reanalyzed. The reanalysis of this spike set identified as B101955-MS2/MSD3 produced recoveries slightly below the control limits. The MS/MSD spiking level was less than 5x the MRL; therefore, the discrepancies could result from variability near the MRL. A post-preparation spike (B101955-PS1) was prepared and analyzed at an appropriate spiking level, and the recovery met the acceptance criteria. As the initial analysis met the acceptance criteria and the spiking level was relatively low compared to the MRL, no results were qualified.

MMA Sequence 1000949

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

MMA Batch B101956

The method blanks (BLKs) reported as B101951-BLK3 and B101951-BLK4 are identified as B101956-BLK3 and B101956-BLK4 in the raw data. Blank were shared between these batches, as they were prepared together.

In instances when the native sample and/or the corresponding DUP produce non-detectable results, the RPD is not calculated (**N/C**).

All results were at or below the associated MDL, and are, therefore, reported at the MDL and qualified **U**. The results above the MDL and less than or equal to the MRL were qualified **B** and should be considered estimates. All data was reported without further qualification and all associated quality control sample results met the acceptance criteria.

We certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. BRL, an accredited laboratory, certifies that the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more details, please see the *Report Information* page in your report. Please feel free to contact us if you have any questions regarding this report.

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Report Information

Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

BLK	method blank	**MS**	matrix spike
BRL	Brooks Rand Labs	**MSD**	matrix spike duplicate
BS	laboratory fortified blank	**ND**	non-detect
CAL	calibration standard	**NR**	non-reportable
CCV	continuing calibration verification	**PS**	post preparation spike
COC	chain of custody record	**REC**	percent recovery
CRM	certified reference material	**RPD**	relative percent difference
D	dissolved fraction	**RSD**	relative standard deviation
DUP	duplicate	**SCV**	secondary calibration verification
ICV	initial calibration verification	**SOP**	standard operating procedure
MDL	method detection limit	**SRM**	standard reference material
MRL	method reporting limit	**T**	total recoverable fraction

Definition of Data Qualifiers

(Effective 9/23/09)

B Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H Holding time and/or preservation requirements not met. Result is estimated.
J Estimated value. A full explanation is presented in the narrative.
J-M Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
J-N Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
M Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
N Spike recovery was not within acceptance criteria. Result is estimated.
R Rejected, unusable value. A full explanation is presented in the narrative.
U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand, Ltd., those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; USEPA; July 2002. These supersede all previous qualifiers ever employed by BRL.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
PR-MOAM-WB-A	1044009-01	Biota	Sample	10/01/2010	10/21/2010
PR-MOAM-WB-B	1044009-02	Biota	Sample	10/01/2010	10/21/2010
PR-MOAM-FT-A	1044009-03	Biota	Sample	10/01/2010	10/21/2010
PR-MOAM-FT-B	1044009-04	Biota	Sample	10/01/2010	10/21/2010
CP-MOAM-WB-A	1044009-05	Biota	Sample	10/01/2010	10/21/2010
CP-MOAM-WB-B	1044009-06	Biota	Sample	10/01/2010	10/21/2010
CP-MOAM-FT-A	1044009-07	Biota	QC Sample	10/01/2010	10/21/2010
CP-MOAM-FT-B	1044009-08	Biota	Sample	10/01/2010	10/21/2010

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
As(III)	Biota	EPA Method 1632	12/02/2010	12/03/2010	B101948	1000936
As(Inorg)	Biota	EPA Method 1632 mod.	12/01/2010	12/02/2010	B101954	1000930
DMAs	Biota	EPA Method 1632	12/05/2010	12/06/2010	B101955	1000946
MMAs	Biota	EPA Method 1632	12/05/2010	12/06/2010	B101956	1000949

ENVIRONMENTAL
Data Services, Inc.

ARSENIC SPECIATION

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: 1044009

Client: Maryland Environmental Service, Millersville, MD Date: December 17, 2010

Laboratory: Brooks Rand Labs, Seattle, WA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	PR-MOAM-WB-A	1044009-01	Tissue
2	PR-MOAM-WB-B	1044009-02	Tissue
3	PR-MOAM-FT-A	1044009-03	Tissue
4	PR-MOAM-FT-B	1044009-04	Tissue
5	CP-MOAM-WB-A	1044009-05	Tissue
6	CP-MOAM-WB-B	1044009-06	Tissue
7	CP-MOAM-FT-A	1044009-07	Tissue
7MS	CP-MOAM-FT-AMS	1044009-07MS	Tissue
7MSD	CP-MOAM-FT-AMSD	1044009-07MSD	Tissue
8	CP-MOAM-FT-B	1044009-08	Tissue
8MS	CP-MOAM-FT-BMS	1044009-08MS	Tissue
8MSD	CP-MOAM-FT-BMSD	1044009-08MSD	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 180 days for arsenic.

Calibration - The ICV and CCV %R values were acceptable with the exception of the following.

CCV	Compound	%R	Qualifier	Affected Samples
CCV4	DMAs	63%	J/UJ	1-6, 8
CCV5	DMAs	56%	J/UJ	
CCV6	DMAs	68%	J/UJ	

Method and Calibration Blanks - All results were method blank corrected per the calculations section of the applicable SOP for this method.

Field and Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - The MS/MSD samples exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
7 (MS/MSD #2)*	DMAs	59%/59%/OK	None	See note below

* - EDS sample ID #7 was inadvertently analyzed twice, but the original run was acceptable so no action was required.

LCS - The LCS samples exhibited acceptable %R values except the following.

LCS ID	Compound	%R	Qualifier	Affected Samples
B101948-BS2	As(III)	42%	L/UL	All samples

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - The concentration of As(V) found in a sample is determined by subtracting the result of the As(III) analysis from the result of the As(Inorg) analysis. Since the As(III) results were qualified (L) due to a low LCS %R value, the results for As(V) were also qualified (L).

Project ID: TST-PI1001
PM: Amanda Fawley

BROOKS RAND LABS
MEANINGFUL METALS DATA

BRL Report 1044009
Client PM: Carrie Gamber
Client PO: C0J060555

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
CP-MOAM-FT-A											
1044009-07	As(III)	Biota	N/A	0.003	UL ~~J,U~~	0.003	0.010	mg/kg	B101948	1000936	7
1044009-07	As(Inorg)	Biota	N/A	0.003	U	0.003	0.010	mg/kg	B101954	1000930	
1044009-07	As(V)	Biota	N/A	0.003	UL ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-07	DMAs	Biota	N/A	0.012		0.003	0.009	mg/kg	B101955	1000946	
1044009-07	MMAs	Biota	N/A	0.005	U	0.005	0.014	mg/kg	B101956	1000949	
CP-MOAM-FT-B											
1044009-08	As(III)	Biota	N/A	0.003	UL ~~J,U~~	0.003	0.010	mg/kg	B101948	1000936	8
1044009-08	As(Inorg)	Biota	N/A	0.003	U	0.003	0.010	mg/kg	B101954	1000930	
1044009-08	As(V)	Biota	N/A	0.003	UL ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-08	DMAs	Biota	N/A	0.005	UJ ~~J,U~~	0.005	0.018	mg/kg	B101955	1000946	
1044009-08	MMAs	Biota	N/A	0.009	U	0.009	0.026	mg/kg	B101956	1000949	
CP-MOAM-WB-A											
1044009-05	As(III)	Biota	N/A	0.096	L ~~J~~	0.003	0.010	mg/kg	B101948	1000936	5
1044009-05	As(Inorg)	Biota	N/A	0.098		0.003	0.009	mg/kg	B101954	1000930	
1044009-05	As(V)	Biota	N/A	0.003	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-05	DMAs	Biota	N/A	0.027	J ~~J~~	0.006	0.020	mg/kg	B101955	1000946	
1044009-05	MMAs	Biota	N/A	0.010	U	0.010	0.029	mg/kg	B101956	1000949	
CP-MOAM-WB-B											
1044009-06	As(III)	Biota	N/A	0.027	L ~~J~~	0.003	0.009	mg/kg	B101948	1000936	6
1044009-06	As(Inorg)	Biota	N/A	0.031		0.003	0.009	mg/kg	B101954	1000930	
1044009-06	As(V)	Biota	N/A	0.003	L ~~J~~	0.003	0.009	mg/kg	[CALC]	N/A	
1044009-06	DMAs	Biota	N/A	0.019	J ~~J~~	0.005	0.017	mg/kg	B101955	1000946	
1044009-06	MMAs	Biota	N/A	0.009	U	0.009	0.026	mg/kg	B101956	1000949	
PR-MOAM-FT-A											
1044009-03	As(III)	Biota	N/A	0.003	UL ~~J,U~~	0.003	0.009	mg/kg	B101948	1000936	3
1044009-03	As(Inorg)	Biota	N/A	0.004	J ~~B~~	0.003	0.009	mg/kg	B101954	1000930	
1044009-03	As(V)	Biota	N/A	0.003	J ~~J~~	0.003	0.009	mg/kg	[CALC]	N/A	
1044009-03	DMAs	Biota	N/A	0.007	J ~~J,B~~	0.003	0.009	mg/kg	B101955	1000946	
1044009-03	MMAs	Biota	N/A	0.004	U	0.004	0.013	mg/kg	B101956	1000949	

MW
12/17/10

Project ID: TST-PI1001
PM: Amanda Fawley

BROOKS RAND LABS
MEANINGFUL METALS DATA

BRL Report 1044009
Client PM: Carrie Gamber
Client PO: C0J060555

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	ED. #
PR-MOAM-FT-B											
1044009-04	As(III)	Biota	N/A	0.003	UL ~~J,U~~	0.003	0.010	mg/kg	B101948	1000936	4
1044009-04	As(Inorg)	Biota	N/A	0.003	U	0.003	0.010	mg/kg	B101954	1000930	
1044009-04	As(V)	Biota	N/A	0.003	UL ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-04	DMAs	Biota	N/A	0.009	J ~~J,B~~	0.006	0.019	mg/kg	B101955	1000946	
1044009-04	MMAs	Biota	N/A	0.005	U	0.005	0.014	mg/kg	B101956	1000949	
PR-MOAM-WB-A											
1044009-01	As(III)	Biota	N/A	0.011	L ~~J~~	0.003	0.009	mg/kg	B101948	1000936	
1044009-01	As(Inorg)	Biota	N/A	0.019		0.003	0.010	mg/kg	B101954	1000930	1
1044009-01	As(V)	Biota	N/A	0.003	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-01	DMAs	Biota	N/A	0.016	J ~~J,B~~	0.006	0.019	mg/kg	B101955	1000946	
1044009-01	MMAs	Biota	N/A	0.010	U	0.010	0.029	mg/kg	B101956	1000949	
PR-MOAM-WB-B											
1044009-02	As(III)	Biota	N/A	0.041	L ~~J~~	0.003	0.010	mg/kg	B101948	1000936	
1044009-02	As(Inorg)	Biota	N/A	0.056		0.003	0.009	mg/kg	B101954	1000930	2
1044009-02	As(V)	Biota	N/A	0.014	L ~~J~~	0.003	0.010	mg/kg	[CALC]	N/A	
1044009-02	DMAs	Biota	N/A	0.034	J ~~J~~	0.005	0.018	mg/kg	B101955	1000946	
1044009-02	MMAs	Biota	N/A	0.009	U	0.009	0.026	mg/kg	B101956	1000949	

AW
12/17/10

Report of Biota Analyses Arsenic Speciation

Project: Sparrows Point
Samples Collected: November 3 - 4, 2010
Report Date: December 28, 2010

Prepared for:
Carrie L. Gamber
Test America - Pittsburgh
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Project ID: TST-PI1001

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Case Narrative

Shipping and Receiving

On November 12, 2010, Brooks Rand Labs (BRL) received twelve biota samples at 10:00 A.M. in a cooler with wet ice at a temperature of 0.6 °C. The sample matrix on the chain-of-custody (COC) form listed the sample matrix as *MARINE\SEDIMENT*. The client was contacted and confirmed that the sample matrix was biota. Samples were homogenized prior to arriving at BRL. The COC forms requested arsenic speciation analysis of the samples, contractually defined as trivalent arsenic [As(III)], inorganic arsenic [As(Inorg)], and pentavalent arsenic [As(V)], monomethylarsonic acid (MMAs), and dimethylarsinic acid (DMAs). The samples were received and stored securely according to BRL standard operating procedures (SOP) and EPA methodology. Results have been reported on a wet-weight basis.

Preservation and Holding Time

All method and SOP requirements for preservation and holding time were satisfied.

Inorganic Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M hydrochloric acid (HCl) and heated for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) sodium borohydride ($NaBH_4$) solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine (AsH_3) to be desorbed is represents total inorganic As in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

In instances where the matrix spike/matrix spike duplicate (MS/MSD) sets were spiked with concentrations less than 25% of the native sample results, the recoveries were not reported (**NR**).

In instances when the native sample and/or the corresponding duplicate (DUP) produced non-detectable results the relative percent difference (RPD) was not calculated (**N/C**).

Sequence 1000965

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The analysis of the highest calibration standard (1000965-CAL5) produced a low recovery and was omitted from the calibration curve. In addition, 1000965-CAL6 was a re-analysis of the lowest calibration standard (1000965-CAL1) and was omitted from the calibration curve. All

sample results were well below the highest calibration standard concentration; therefore, no further corrective action was required.

Batch B102054

The sample concentration for *ATO-649A-W* (1046041-01) was above the high calibration standard. The sample was re-analyzed at an appropriate dilution and the re-analysis was reported.

The MS/MSD sets prepared on samples *ATO-649A-W* (1046041-01) and *ATO-649A-C* (1046041-07) identified as B102054-MS1/MSD1 and B102054-MS2/MSD2, respectively, had spiking levels less than the native sample concentrations. Post-preparation spikes (B102054-PS1 and B102054-PS2) were prepared and analyzed at appropriate spiking levels. The recoveries met the acceptance criteria and no results were qualified.

Aside from concentration qualifiers, all sample results are reported without qualification and all quality control sample results met the acceptance criteria.

Trivalent Arsenic in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, the samples are extracted with 0.5 M phosphoric acid (H_3PO_4) and 0.1 M hydroxylamine hydrochloride ($NH_2OH{\cdot}HCl$), tumbled for one hour, and then centrifuged for 20 - 30 minutes. An aliquot of tissue digestate is diluted to final volume with a 0.5% (v/v) HCl solution, the pH is adjusted with a 2% (m/v) potassium hydroxide (KOH) solution, and 2.5 M trishydrochloride buffer is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection. The first arsine to be desorbed is AsH_3, which represents As(III) in the sample.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the Sample Results page for sample-specific MDLs, MRLs, and other details.

Sequence 1000974

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

Batch B102055

The analysis of the matrix spike (B102055-MS1) prepared on sample *ATO-649A-W* (1046041-01) yielded a low recovery of 40%, likely due to the spiking level being less than the native sample concentration. In an effort to provide additional evidence of analytical precision at the instrument and spiking level accuracy at sample analysis, a post preparation spike (PS) was analyzed at an appropriate spiking level. In order for this PS (B102055-PS1) to recover within the calibration limits sample *ATO-649A-W* (1046041-01) was analyzed using a lower volume (1 mL).and met the acceptance criteria. Since the RPD between the results from the initial analysis (0.128 µg/L) and reanalysis (0.151 µg/L) met the acceptance criteria for duplicate precision (16%; RPD criteria ≤ 35%), the initial analysis, which used the higher analytical volume (2 mL), has been reported and used for all calculations of recoveries. Since all other quality control parameters recovered within acceptance limits, no qualification was necessary.

Aside from concentration qualifiers, all sample results are reported without qualification and all other quality control sample results met the acceptance criteria.

Pentavalent Arsenic in Biota by Calculation

The concentration of As(V) found in a sample is determined by subtracting the result of the analysis of As(III) from the result of the analysis of As(Inorg). The MDL and MRL for As(V) are equal to the MDL and MRL for As(III) or As(Inorg), whichever is greater.

Aside from concentration qualifiers, all sample results are reported without qualification.

DMAs & MMAs in Biota by EPA Method 1632, Modified (SOP BR-0021)

Prior to analysis, samples are digested with 2 M sodium hydroxide (NaOH) and heated at 80 °C for 16 hours. Then, an aliquot of biota digestate is placed in a specially-designed reaction vessel and 6 M HCl is added. To this, a 4% (m/v) $NaBH_4$ solution is added to convert the inorganic arsenic to volatile arsines. Arsines are purged from the sample onto a cooled glass trap. The trapped arsines are thermally desorbed, in order of increasing boiling points, into an inert gas stream that carries them into the quartz furnace of an atomic absorption spectrophotometer for detection.

The results were method blank-corrected as described in the calculations section of the relevant BRL SOP(s) and may have been evaluated using reporting limits that have been adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

DMA Sequence 1000984

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

The continuing calibration verification (CCV) standards identified as 1000984-CCV3 and -CCV6 produced recoveries below the control limits (at 65% and 57%, respectively). Two post-preparation spikes performed on samples *ATO-649A-W* (1046041-01) and *ATO-649A-C* (1046041-07) met the acceptance criteria between 1000984-CCV2 and 1000984-CCV3. The post-preparation spike B102057-PS2 was analyzed immediately prior to 1000984-CCV3 demonstrating that the recovery of 1000984-CCV3 was not indicative of a low bias affecting this portion of the analysis. With the exception of *ATO-649A-W* (1046041-01) and *ATO-649A-C* (1046041-07), all samples were re-prepared and re-analyzed in batch B102211.

DMA Batch B102057

The DMA sample concentration for *ATO-649A-W* (1046041-01) was above the high calibration standard. The sample was re-analyzed at an appropriate dilution for DMA and the re-analysis was reported.

The MS/MSD sets prepared on samples *ATO-649A-W* (1046041-01) and *ATO-649A-C* (1046041-07) identified as B102057-MS1/MSD1 and B102057-MS2/MSD2, respectively, had spiking levels ≤ 25% of the native sample concentration. Post-preparation spikes (B102057-PS1 and B102057-PS2) were prepared and analyzed at appropriate spiking levels. The recoveries met the acceptance criteria and no results were qualified.

DMA Sequence 1001007

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

An acceptable recovery for the 1 ng standard was unable to be obtained. However, an acceptable calibration ranging from 2 ng (1001007-CAL1) to 20 ng (1001007-CAL4) was obtained. A 30 ng standard was also analyzed, but it produced a high recovery and was not included in the calibration curve. Due to the elevation of the low standard from 1 ng to 2 ng, the MRL was elevated to 0.020 mg/kg, but the elevation of the MDL was not necessary.

DMA Batch B102211

The analysis of the MS/MSD set performed on sample *ATO-649B-C* (1046041-08) produced recoveries above the control limits, 159% and 159%, respectively. As such, the sample result was qualified **N** for high spike recoveries. All sample results in this batch have been qualified **J-N** and should be considered estimates.

MMA Sequence 1000977

Instrument calibration, meeting all quality control criteria, was successfully achieved on the day of sample analysis.

MMA Batch B102056

The MMA analysis occurred at the same time as the DMA analysis (B102057). The DMA sample concentration for *ATO-649A-W* (1046041-01) was above the high calibration standard. The sample was re-analyzed at an appropriate dilution for DMA and the re-analysis was reported for both the MMA and DMA. The DMA for sample *ATO-649A-W* (1046041-01) was very high relative to the MMA level; such that no MMA peak was visible when the sample was analyzed at a dilution appropriate for MMA due to the large size of the DMA peak. Analyzing at a lower dilution to attempt to quantify MMA was problematic due to peak interference by DMA. Therefore, the MMA analysis was reported from the higher dilution due to possible DMA interference.

The MS/MSD sets prepared on samples *ATO-649A-W* (1046041-01) and *ATO-649A-C* (1046041-07) identified as B102056-MS1/MSD1 and B102056-MS2/MSD2, respectively, produced results that were below the MRL. Post-preparation spikes (B102056-PS1 and B102056-PS2) were prepared and analyzed at spiking levels above the MRL. All recoveries met the acceptance criteria and no results were qualified.

All results were at or below the associated MDL, and are, therefore, reported at the MDL and qualified **U**. All data was reported without further qualification and all associated quality control sample results met the acceptance criteria.

We certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. BRL, an accredited laboratory, certifies that the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more details, please see the *Report Information* page in your report. Please feel free to contact us if you have any questions regarding this report.

Amanda Fawley
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Report Information

Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations /certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

BLK	method blank	**MS**	matrix spike
BRL	Brooks Rand Labs	**MSD**	matrix spike duplicate
BS	laboratory fortified blank	**ND**	non-detect
CAL	calibration standard	**NR**	non-reportable
CCV	continuing calibration verification	**PS**	post preparation spike
COC	chain of custody record	**REC**	percent recovery
CRM	certified reference material	**RPD**	relative percent difference
D	dissolved fraction	**RSD**	relative standard deviation
DUP	duplicate	**SCV**	secondary calibration verification
ICV	initial calibration verification	**SOP**	standard operating procedure
MDL	method detection limit	**SRM**	standard reference material
MRL	method reporting limit	**T**	total recoverable fraction

Definition of Data Qualifiers

(Effective 9/23/09)

B Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H Holding time and/or preservation requirements not met. Result is estimated.
J Estimated value. A full explanation is presented in the narrative.
J-M Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
J-N Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
M Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
N Spike recovery was not within acceptance criteria. Result is estimated.
R Rejected, unusable value. A full explanation is presented in the narrative.
U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand, Ltd., those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; USEPA; July 2002. These supersede all previous qualifiers ever employed by BRL.

Project ID: TST-PI1001
PM: Amanda Fawley

Client PM: Carrie Gamber
Client PO: 18006088

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
ATO-649A-W	1046041-01	Biota	Sample	11/03/2010	11/12/2010
ATO-649B-W	1046041-02	Biota	Sample	11/03/2010	11/12/2010
ATO-650A-W	1046041-03	Biota	Sample	11/03/2010	11/12/2010
ATO-650B-W	1046041-04	Biota	Sample	11/03/2010	11/12/2010
PRETEST A-W	1046041-05	Biota	Sample	11/03/2010	11/12/2010
PRETEST B-W	1046041-06	Biota	Sample	11/03/2010	11/12/2010
ATO-649A-C	1046041-07	Biota	Sample	11/04/2010	11/12/2010
ATO-649B-C	1046041-08	Biota	Sample	11/04/2010	11/12/2010
ATO-650A-C	1046041-09	Biota	Sample	11/04/2010	11/12/2010
ATO-650B-C	1046041-10	Biota	Sample	11/04/2010	11/12/2010
PRETESTA-C	1046041-11	Biota	Sample	11/04/2010	11/12/2010
PRETESTB-C	1046041-12	Biota	Sample	11/04/2010	11/12/2010

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
As(III)	Biota	EPA Method 1632	12/13/2010	12/14/2010	B102055	1000974
As(Inorg)	Biota	EPA Method 1632 mod.	12/09/2010	12/10/2010	B102054	1000965
DMAs	Biota	EPA Method 1632	12/14/2010	12/15/2010	B102057	1000984
DMAs	Biota	EPA Method 1632	12/21/2010	12/23/2010	B102211	1001007
MMAs	Biota	EPA Method 1632	12/14/2010	12/15/2010	B102056	1000977

ENVIRONMENTAL
Data Services, Inc.

ARSENIC SPECIATION

USEPA Region III - Level IV Review

Site: Sparrows Point, Tissue Study SDG #: 1046041

Client: Maryland Environmental Service, Millersville, MD Date: December 29, 2010

Laboratory: Brooks Rand Labs, Seattle, WA Reviewer: Nancy Weaver

EDS ID	Client Sample ID	Laboratory Sample ID	Matrix
1	ATO-649A-W	1046041-01	Tissue
1MS	ATO-649A-WMS	1046041-01MS	Tissue
1MSD	ATO-649A-WMSD	1046041-01MSD	Tissue
2	ATO-649B-W	1046041-02	Tissue
3	ATO-650A-W	1046041-03	Tissue
4	ATO-650B-W	1046041-04	Tissue
5	PRETESTA-W	1046041-05	Tissue
6	PRETESTB-W	1046041-06	Tissue
7	ATO-649A-C	1046041-07	Tissue
7MS	ATO-649A-CMS	1046041-07MS	Tissue
7MSD	ATO-649A-CMSD	1046041-07MSD	Tissue
8	ATO-649B-C	1046041-08	Tissue
8MS	ATO-649B-CMS	1046041-08MS	Tissue
8MSD	ATO-649B-CMSD	1046041-08MSD	Tissue
9	ATO-650A-C	1046041-09	Tissue
10	ATO-650B-C	1046041-10	Tissue
11	PRETESTA-C	1046041-11	Tissue
12	PRETESTB-C	1046041-12	Tissue

The USEPA "Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", April 1993, and professional judgement were used in evaluating the data in this summary report.

Holding Times - All samples were prepared and analyzed within 180 days for arsenic.

Calibration - The ICV and CCV %R values were acceptable with the exception of the following.

CCV	Compound	%R	Qualifier	Affected Samples
CCV3	DMAs	65%	J/UJ	1, 7
CCV6	DMAs	57%	J/UJ	

Method and Calibration Blanks - All results were method blank corrected per the calculations section of the applicable SOP for this method.

Field and Equipment Blank - Field QC samples were not included in this data package.

MS/MSD - The MS/MSD samples exhibited acceptable %R and RPD values except the following.

MS/MSD Sample ID	Compound	MS/MSD %R/RPD	Qualifier	Affected Samples
1	As (III)	40%/Ok/Ok	L/UL	All Samples
8	DMAs	159%/159%/OK	K	All Samples except 1,7

LCS - The LCS samples exhibited acceptable %R values.

Field Duplicates - Field duplicate samples were not analyzed.

Compound Quantitation - The concentration of As(V) found in a sample is determined by subtracting the result of the As(III) analysis from the result of the As(Inorg) analysis. Since the As(III) results were qualified (L/UL) due to a low MS %R value, the results for As(V) were also qualified (L/UL).

Project ID: TST-PI1001
PM: Amanda Fawley

BRL Report 1046041
Client PM: Carrie Gamber
Client PO: 18006088

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
ATO-649A-C											
1046041-07	As(III)	Biota	N/A	0.109	L	0.006	0.019	mg/kg	B102055	1000974	7
1046041-07	As(Inorg)	Biota	N/A	0.147		0.011	0.038	mg/kg	B102054	1000965	
1046041-07	As(V)	Biota	N/A	0.038	L	0.011	0.038	mg/kg	[CALC]	N/A	
1046041-07	DMAs	Biota	N/A	0.653	J	0.028	0.093	mg/kg	B102057	1000984	
1046041-07	MMAs	Biota	N/A	0.028	U	0.028	0.093	mg/kg	B102056	1000977	
ATO-649A-W											
1046041-01	As(III)	Biota	N/A	0.128	L	0.003	0.009	mg/kg	B102055	1000974	1
1046041-01	As(Inorg)	Biota	N/A	0.207		0.011	0.038	mg/kg	B102054	1000965	
1046041-01	As(V)	Biota	N/A	0.079	L	0.011	0.038	mg/kg	[CALC]	N/A	
1046041-01	DMAs	Biota	N/A	0.425	J	0.027	0.091	mg/kg	B102057	1000984	
1046041-01	MMAs	Biota	N/A	0.027	U	0.027	0.091	mg/kg	B102056	1000977	
ATO-649B-C											
1046041-08	As(III)	Biota	N/A	0.101	L	0.006	0.019	mg/kg	B102055	1000974	8
1046041-08	As(Inorg)	Biota	N/A	0.137		0.011	0.038	mg/kg	B102054	1000965	
1046041-08	As(V)	Biota	N/A	0.036	L ~~B~~	0.011	0.038	mg/kg	[CALC]	N/A	
1046041-08	DMAs	Biota	N/A	0.617	K ~~N~~	0.029	0.193	mg/kg	B102211	1001007	
1046041-08	MMAs	Biota	N/A	0.026	U	0.026	0.086	mg/kg	B102056	1000977	
ATO-649B-W											
1046041-02	As(III)	Biota	N/A	0.141	L	0.006	0.019	mg/kg	B102055	1000974	2
1046041-02	As(Inorg)	Biota	N/A	0.189		0.012	0.040	mg/kg	B102054	1000965	
1046041-02	As(V)	Biota	N/A	0.048	L	0.012	0.040	mg/kg	[CALC]	N/A	
1046041-02	DMAs	Biota	N/A	0.718	K ~~J,N~~	0.028	0.185	mg/kg	B102211	1001007	
1046041-02	MMAs	Biota	N/A	0.029	U	0.029	0.096	mg/kg	B102056	1000977	
ATO-650A-C											
1046041-09	As(III)	Biota	N/A	0.079	L	0.005	0.018	mg/kg	B102055	1000974	9
1046041-09	As(Inorg)	Biota	N/A	0.105		0.012	0.038	mg/kg	B102054	1000965	
1046041-09	As(V)	Biota	N/A	0.026	L ~~B~~	0.012	0.038	mg/kg	[CALC]	N/A	
1046041-09	DMAs	Biota	N/A	0.745	K ~~J,N~~	0.028	0.184	mg/kg	B102211	1001007	
1046041-09	MMAs	Biota	N/A	0.027	U	0.027	0.092	mg/kg	B102056	1000977	

DW
12/28/10

Project ID: TST-PI1001
PM: Amanda Fawley

BROOKS RAND LABS
MEANINGFUL METALS DATA

BRL Report 1046041
Client PM: Carrie Gamber
Client PO: 18006088

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
ATO-650A-W											
1046041-03	As(III)	Biota	N/A	0.004	L ~~B~~	0.003	0.010	mg/kg	B102055	1000974	3
1046041-03	As(Inorg)	Biota	N/A	0.006	~~B~~	0.003	0.009	mg/kg	B102054	1000965	
1046041-03	As(V)	Biota	N/A	0.003	UL ~~U~~	0.003	0.010	mg/kg	[CALC]	N/A	
1046041-03	DMAs	Biota	N/A	0.679	K ~~J-N~~	0.029	0.192	mg/kg	B102211	1001007	
1046041-03	MMAs	Biota	N/A	0.028	U	0.028	0.094	mg/kg	B102056	1000977	
ATO-650B-C											
1046041-10	As(III)	Biota	N/A	0.075	L	0.005	0.018	mg/kg	B102055	1000974	10
1046041-10	As(Inorg)	Biota	N/A	0.097		0.012	0.038	mg/kg	B102054	1000965	
1046041-10	As(V)	Biota	N/A	0.022	L ~~B~~	0.012	0.038	mg/kg	[CALC]	N/A	
1046041-10	DMAs	Biota	N/A	0.441	K ~~J-N~~	0.029	0.190	mg/kg	B102211	1001007	
1046041-10	MMAs	Biota	N/A	0.027	U	0.027	0.091	mg/kg	B102056	1000977	
ATO-650B-W											
1046041-04	As(III)	Biota	N/A	0.005	L ~~B~~	0.003	0.010	mg/kg	B102055	1000974	4
1046041-04	As(Inorg)	Biota	N/A	0.006	~~B~~	0.003	0.010	mg/kg	B102054	1000965	
1046041-04	As(V)	Biota	N/A	0.003	UL ~~U~~	0.003	0.010	mg/kg	[CALC]	N/A	
1046041-04	DMAs	Biota	N/A	0.709	K ~~J-N~~	0.029	0.195	mg/kg	B102211	1001007	
1046041-04	MMAs	Biota	N/A	0.030	U	0.030	0.098	mg/kg	B102056	1000977	
PRETEST A-W											
1046041-05	As(III)	Biota	N/A	0.082	L	0.003	0.010	mg/kg	B102055	1000974	5
1046041-05	As(Inorg)	Biota	N/A	0.152		0.003	0.010	mg/kg	B102054	1000965	
1046041-05	As(V)	Biota	N/A	0.070	L	0.003	0.010	mg/kg	[CALC]	N/A	
1046041-05	DMAs	Biota	N/A	0.923	K ~~J-N~~	0.030	0.198	mg/kg	B102211	1001007	
1046041-05	MMAs	Biota	N/A	0.030	U	0.030	0.099	mg/kg	B102056	1000977	
PRETEST B-W											
1046041-06	As(III)	Biota	N/A	0.101	L	0.003	0.009	mg/kg	B102055	1000974	6
1046041-06	As(Inorg)	Biota	N/A	0.242		0.012	0.040	mg/kg	B102054	1000965	
1046041-06	As(V)	Biota	N/A	0.141	L	0.012	0.040	mg/kg	[CALC]	N/A	
1046041-06	DMAs	Biota	N/A	1.05	K ~~J-N~~	0.029	0.195	mg/kg	B102211	1001007	
1046041-06	MMAs	Biota	N/A	0.028	U	0.028	0.092	mg/kg	B102056	1000977	

MW
12/28/10

Project ID: TST-PI1001
PM: Amanda Fawley

BRL Report 1046041
Client PM: Carrie Gamber
Client PO: 18006088

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence	EDS #
PRETESTA-C											
1046041-11	As(III)	Biota	N/A	0.083	L	0.006	0.019	mg/kg	B102055	1000974	11
1046041-11	As(Inorg)	Biota	N/A	0.101		0.012	0.040	mg/kg	B102054	1000965	
1046041-11	As(V)	Biota	N/A	0.018	L ~~B~~	0.012	0.040	mg/kg	[CALC]	N/A	
1046041-11	DMAs	Biota	N/A	0.537	K ~~JN~~	0.026	0.171	mg/kg	B102211	1001007	
1046041-11	MMAs	Biota	N/A	0.029	U	0.029	0.098	mg/kg	B102056	1000977	
PRETESTB-C											
1046041-12	As(III)	Biota	N/A	0.072	L	0.005	0.018	mg/kg	B102055	1000974	12
1046041-12	As(Inorg)	Biota	N/A	0.093		0.012	0.039	mg/kg	B102054	1000965	
1046041-12	As(V)	Biota	N/A	0.021	L ~~B~~	0.012	0.039	mg/kg	[CALC]	N/A	
1046041-12	DMAs	Biota	N/A	0.586	K ~~JN~~	0.028	0.189	mg/kg	B102211	1001007	
1046041-12	MMAs	Biota	N/A	0.029	U	0.029	0.095	mg/kg	B102056	1000977	

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ATTACHMENT E:

EA ECOTOXICOLOGICAL BIOACCUMULATION STUDIES REPORT

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ECOTOXICOLOGICAL TESTING: SOLID PHASE BIOACCUMULATION STUDY FOR THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY BALTIMORE HARBOR, MARYLAND

Prepared for

Maryland Port Administration
2310 Broening Highway
Baltimore, Maryland 21224

Under Contract to
Maryland Environmental Service
259 Najoles Road
Millersville, Maryland 21108

Prepared by:

EA Engineering, Science, and Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
For questions concerning this report, please contact Wayne McCulloch
ph: 410-771-4950

Results relate only to the items tested or to the samples as received by the laboratory.

This report shall not be reproduced, except in full, without written approval of EA Engineering, Science, and Technology, Inc.

This report contains 13 pages plus 4 attachments.

Wayne L. McCulloch
Laboratory Director

6 January 2011
Date

EA Project Number 1469601

ACCREDITED IN ACCORDANCE WITH nelac
E87550

EA Report Number 6116

1. INTRODUCTION

EA Engineering, Science, and Technology performed solid phase bioaccumulation testing on one composite sediment sample collected from the offshore areas adjacent to the proposed Coke Point Dredged Material Containment Facility (DMCF) in Baltimore Harbor, Maryland. The purpose of this study was to evaluate the toxicity and bioaccumulation potential of this sediment sample compared to a Baltimore Harbor reference site sample, which was collected from Sollers Point.

The toxicity testing program consisted of 28-day bioaccumulation tests with *Nereis virens* (sand worm) and *Macoma nasuta* (blunt-nose clam). The bioaccumulation tests evaluated survival of the test organisms and bioaccumulative effects as a result of exposure to one composite sediment sample collected from the offshore areas adjacent to the Coke Point Peninsula. At the completion of the bioaccumulation testing, the organism tissues were submitted for selected chemical analyses, the results of which are not included in this report.

2. MATERIALS AND METHODS

2.1 SAMPLE RECEIPT AND PREPARATION

Surficial sediment was collected from the offshore areas adjacent to the Coke Point Peninsula in the Patapsco River, south of the City of Baltimore. A total of 5 locations from the offshore areas adjacent to the Coke Point Peninsula were sampled, and based on the results of chemical testing, sediment from a total of 2 locations was used to create the sediment composite used in the bioaccumulation studies. Reference sediment was also collected from one area in the Patapsco River, near Soller's Point. A total of 3 reference site locations were also sampled, and based on the results of chemical testing, sediment from each of the 3 locations was used to create the sediment composite used in the bioaccumulation studies. Surficial sediment samples were collected and composited by EA personnel, and were placed into 5-gallon buckets. The sediments were held at ≤4°C and were hand delivered to EA's Ecotoxicology Laboratory in Sparks, Maryland. Upon receipt at EA, the sediment samples were logged in and assigned EA laboratory accession numbers, and were stored in the dark in a secured walk-in cooler at ≤4°C until used for testing. Table 1 summarizes the sample identification, accession numbers, and collection/receipt information for the sediment samples. Chain-of-custody records are included in Attachment I.

2.2 TOXICITY TEST METHODS

All toxicity testing was conducted following EA's standard operating procedures (EA 2006) which are in accordance with USEPA guidance (2000) and USEPA/USACE guidance (1991, 1998).

2.2.1 Bioaccumulation Testing

Bioaccumulation testing was conducted using the blunt-nose clam (*Macoma nasuta*) and the sand worm (*Nereis virens*). The adult clams (lot number MA-033) and the adult worms (NV-040) were received from Aquatic Research Organisms (Hampton, New Hampshire) on 5 October 2010. The clams were placed in clean seawater and allowed to depurate accumulated

waste products, prior to use in testing. The *N. virens* were loaded into the test immediately to minimize cannibalism/holding stress.

The sediment and overlying water were added to the test chambers a minimum of one day prior to test initiation to allow time for the suspended sediments to settle. The overlying water was 30 ppt artificial seawater (Crystal Sea artificial sea salts). Natural sediments from the organism collection sites were used as laboratory controls in the bioaccumulation testing. Control sediment used in the *N. virens* test was collected from the Damariscotta River, Booth Bay Harbor, Maine. The sediment used in the clam bioaccumulation test was collected from Tomales Bay, California. The bioaccumulation tests were 28 days in duration and were conducted as static renewal assays. The overlying water was replaced three times a week by siphoning approximately 80 percent of the overlying water from the aquaria and replacing with new overlying water taking care not to disturb the sediment surface.

The bioaccumulation tests were conducted in 10-gallon aquaria with 5 L of sediment and 27 L of overlying water per aquarium. There were five replicates per reference and test sediment, and three replicates per control sediment. Based on the analytical tissue biomass requirements, 25 organisms were randomly introduced into each replicate chamber for the *N. virens* testing, while the *M. nasuta* testing utilized 50 organisms per chamber.

During the 28-day exposure period, the test chambers were maintained at a target temperature of 20±1°C for *N. virens* and 12±1°C for *M. nasuta* with a 16-hour light/8-hour dark photoperiod. Gentle aeration was provided to each aquarium throughout the test period. Observations of mortality and abnormal organism behavior were recorded daily, and dead organisms were removed, as observed, from the test chambers. Measurements of temperature, pH, dissolved oxygen, and salinity of the overlying water were recorded on one replicate of each sample and control at test initiation, termination, and three times a week prior to replacement of the overlying water. The water quality measurements are summarized in Table 2 *(N. virens*) and Table 3 (*M. nasuta*). The organisms were not fed during the exposure period.

The bioaccumulation tests were initiated on 5 October (*N. virens*) and 6 October (*M. nasuta*) and completed on 2 November and 3 November 2010, respectively. After 28 days of exposure, the

organisms were recovered from the samples and placed into clean artificial sea water for 24 hours to purge their digestive tracts. After the depuration period, the organism tissues were collected and submitted for chemical analyses. Copies of the original data sheets from the *N. virens* and *M. nasuta* testing are included in Attachments II and III, respectively.

2.2.2 Data Analysis

Statistical analyses were performed on the survival data from the bioaccumulation tests according to USEPA/USACE (1998) guidance, using the ToxCalc statistical software package (Version 5.0, Tidepool Scientific Software). If survival in the Coke Point sediment was at least 10 percent less than in the reference, then a t-test or Wilcoxon's Two-Sample Test (depending on normal or non-normal data distribution) was performed on the sediment sample. The statistical analysis was performed to determine if exposure to the Coke Point sediment sample resulted in significantly lower survival ($p=0.05$) as compared to the organisms exposed to the reference sediment. The survival data from the *N. virens* and *M. nasuta* bioaccumulation testing are summarized in Tables 4 and 5, respectively.

2.2.3 Reference Toxicant Testing

In conformance with EA's quality assurance/quality control program requirements, reference toxicant testing was performed by EA on the acquired lots of *N. virens* and *M. nasuta* utilized in the testing program. The reference toxicant tests consisted of a graded concentration series of a specific toxicant in water only tests, with no sediment present in the test chambers. The results of the reference toxicant tests were compared to established control chart limits. Table 6 presents the results of the reference toxicant testing.

2.3 ARCHIVES

Original data sheets, records, memoranda, notes, and computer printouts are archived at EA's Baltimore Office in Sparks, Maryland. These data will be retained for a period of 5 years unless a longer period of time is requested by Maryland Port Administration or Maryland Environmental Service.

3. RESULTS AND DISCUSSION

This bioaccumulation study with the sediment collected offshore from the proposed Coke Point DMCF was designed and conducted to meet the requirements of the USEPA/USACE dredged material testing program. The results of these toxicity tests met the current NELAC standards, where applicable.

3.1 BIOACCUMULATION TESTING

Tables 4 and 5 summarize the survival of *N. virens* and *M. nasuta*, respectively, following 28 days of exposure to the sediment samples. At test termination, there was 100 percent survival of *N. virens* exposed to the Coke Point sediment (CP-SED-COMP), the reference sediment (PR-SED-COMP), and the laboratory control.

In the *M. nasuta* bioaccumulation test, the Coke Point sample (CP-SED-COMP) had 85 percent survival at test termination. This was statistically less ($p=0.05$) than the reference sample (PR-SED-COMP), which had 96 percent survival. The lab control had 91 percent survival.

3.2 REFERENCE TOXICANT TESTS

The results of the reference toxicant tests are summarized in Table 6. All of the reference toxicant test results fell within the established laboratory control chart limits.

4. REFERENCES CITED

EA. 2006. EA Ecotoxicology Laboratory Quality Assurance and Standard Operating Procedures Manual. EA Manual ATS-102. Internal document prepared by EA's Ecotoxicology Laboratory, EA Engineering, Science, and Technology, Inc., Sparks, Maryland.

USEPA. 2000. Mid-Atlantic Regional Implementation Manual: Dredged Material Evaluation for Norfolk and Dam Neck Ocean Disposal Sites. USEPA-Region 3.

USEPA and USACE. 1991. Evaluation of Dredged Material Proposal for Ocean Disposal, Testing Manual (commonly called "The Green Book").

USEPA and USACE. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.-Inland Testing Manual. EPA/823/B-94/004. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. and Department of the Army, U.S. Army Corps of Engineers, Washington, D.C.

TABLE 1 SUMMARY OF COLLECTION/COMPOSITE AND RECEIPT INFORMATION FOR SEDIMENT SAMPLES – PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY, BALTIMORE HARBOR, MARYLAND

Sample Identification	**EA Accession Number**	**Composite Time and Date**	**Receipt Time and Date**
CP-SED-COMP	AT0-649	1200, 1 October 2010	1602, 1 October 2010
Reference Sediment:			
PR-SED-COMP	AT0-650	1200, 1 October 2010	1602, 1 October 2010

TABLE 2 SUMMARY OF WATER QUALITY PARAMETERS MEASURED DURING BIOACCUMULATION TESTING WITH *Nereis virens* – PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY, BALTIMORE HARBOR, MARYLAND

Test Number: **TN-10-1050**
Testing Dates: **10/05/10 – 11/02/10**

Sediment Sample Identification	**EA Accession Number**	**Range**			
		Temperature (°C)	**pH**	**Dissolved Oxygen (mg/L)**	**Salinity (ppt)**
CP-SED-COMP	AT0-649	18.2 – 20.3	7.4 – 8.4	5.1 – 8.2	29.4 – 31.5
PR-SED-COMP	AT0-650	18.2 – 20.2	7.5 – 8.3	5.9 – 8.2	30.1 – 31.9
LAB CONTROL	AT0-682	18.0 – 20.3	7.2 – 8.3	5.6 – 8.0	30.2 – 31.7

TABLE 3 SUMMARY OF WATER QUALITY PARAMETERS MEASURED DURING BIOACCUMULATION TESTING WITH *Macoma nasuta* – PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY, BALTIMORE HARBOR, MARYLAND

Test Number: **TN-10-1051**
Testing Dates: **10/06/10 – 11/03/10**

Sediment Sample Identification	EA Accession Number	Range			
		Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Salinity (ppt)
CP-SED-COMP	AT0-649	11.3 – 13.3	7.8 – 8.3	6.3 – 8.9	27.4 – 32.1
PR-SED-COMP	AT0-650	11.4 – 13.2	7.9 – 8.3	6.8 – 8.3	27.9 – 32.0
LAB CONTROL	AT0-683	11.5 – 13.6	7.8 – 8.3	6.8 – 8.7	28.2 – 32.1

TABLE 4 RESULTS OF 28-DAY BIOACCUMULATION TESTING WITH *Nereis virens* - PROPOSED COKE POINT DMCF, BALTIMORE HARBOR, MARYLAND

Test Number: TN-10-1050
Testing Dates: 10/05/10 - 11/02/10

Sample Identification	EA Accession Number	No. Alive/No. Exposed[a]	28-Day Mean Percent Survival
CP-SED-COMP	AT0-649	125 / 125	100
Reference Sediment:			
PR-SED-COMP	AT0-650	125 / 125	100
Control:			
LAB CONTROL	AT0-682	75 / 75	100

(a) Total for five replicates of twenty-five organisms for all test sediments except for control, which had three replicates.

TABLE 5 RESULTS OF 28-DAY BIOACCUMULATION TESTING WITH *Macoma nasuta* - PROPOSED COKE POINT DMCF, BALTIMORE HARBOR, MARYLAND

Test Number: TN-10-1151
Testing Dates: 10/06/10 - 11/03/10

Sample Identification	EA Accession Number	No. Alive/No. Exposed[a]	28-Day Mean Percent Survival
CP-SED-COMP	AT0-649	212 / 250	85[b]
Reference Sediment:			
PR-SED-COMP	AT0-650	240 / 250	96
Control:			
LAB CONTROL	AT0-683	136 / 150	91

(a) Total for five replicates of fifty organisms for all test sediments except for control, which had three replicates.
(d) Statistically different (p=0.05) from reference sediment.

TABLE 6 RESULTS OF REFERENCE TOXICANT TESTING ON ACQUIRED LOTS OF TEST ORGANISMS – PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY, BALTIMORE HARBOR, MARYLAND

Test Species	Organism Lot Number	Reference Toxicant	Test Endpoint	Acceptable Control Chart Limits
Nereis virens	NV-040	Sodium dodecyl sulfate (SDS)	48-Hour EC50: 29.7 mg/L SDS	4.3-39.0 mg/L SDS
Macoma nasuta	MA-033	Potassium chloride (KCl)	48-Hour LC50: 1,573 mg/L KCl	986-2,221 mg/L KCl

ATTACHMENT I

Chain-of-Custody Records
(2 pages)

Chain-of-Custody Record

EA Engineering, Science, and Technology

EA Ecotoxicology Laboratory
15 Loveton Circle
Sparks (Baltimore), Maryland 21152
Telephone: (410) 771-4950
Fax: (410) 771-4204

FOR OFFICE USE ONLY
Species to be tested:

_____	*D. manga*	_____	*Menidia sp.*
_____	*D. pulex*	_____	*P. pugio*
_____	*C. dubia*	_____	*C. variegatus*
_____	*P. promelas*	_____	*M. bahia*
_____	*Other*	_____	*Other*

A = Acute C = Chornic B = Bioaccumulation

Client: Coke Point Project Project No.: 1453417

NPDES Number: N/A Client Purchase Order Number: N/A

State/City/County Collected: _____

PLEASE READ SAMPLING INSTRUCTIONS ON BACK OF FORM

Accession Number (office use only)	Grab	Composite	Collection Start Date/Time	Collection End Date/Time	Sample Description (including Site, Station Number, and Outfall Number)	Number/Volume of Container
ATO-650		✓	10/1/10	12:00	PR-SED-COMP (REF)	(6) 5-gal
ATO-649		✓	10/1/10	12:00	CP-SED-COMP	(3) 5-gal

Sampled By: Adam Kumm, Sarah Grammer	Date/Time 01 OCT 10 1602	Received By:	Date/Time
Sampler's Printed Name: Adam Kumm	Title: Scientist	Relinquished By:	Date/Time
Relinquished By:	Date/Time 01 OCT 10 1602	Received By Laboratory: Wayne McGillock	Date/Time 10/1/10 1602

Was Sample Chilled During Collection? Yes/No

Comments:

Sample Shipped By: (circle)

Fed. Ex. Puro. UPS Airborne

Other: HAND CARRIED

ATTACHMENT II

Neries virens 28-Day Solid Phase Bioaccumulation Testing
Data Sheets and Statistical Analyses
(12 pages)

SEDIMENT TOXICITY TEST SET-UP BENCH SHEET

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1050

TEST ORGANISM INFORMATION

Common Name: Sand worm

Scientific Name: *Nereis virens*

Lot Number: NV-040

Source: ARO

Adults Isolated (Time, Date): _

Neonates Pulled (Time, Date): _____

Acclimation: <24 hours Age: Adult

Culture Water (T/S): — °C — ppt

TEST INITIATION

Date	Time	Initials	Activity
10/4/10	1100	WLM, MKC, VAS	Sediment Added to Chambers
10/4/10	1215	MKC, VAS	Overlying Water Added to Chambers
10/5/10	1110	MKC, VAS	Organisms Transferred

TEST SET-UP

Sample Number(s): AT0-649, AT0-650 (Reference), ATO-682 (Lab Control)

Overyling Water Number: 30 ppt Crystal Sea

Treatment	Volume Test Sediment	Volume Overlying Water
AT0-649	5 L	7 gal
AT0-650 (Reference)	↓	↓
AT0-682 (Lab Control)		

TOXICOLOGY LABORATORY BENCH SHEET - ORGANISM LOADING RECORD

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1050

TEST ORGANISM

Common Name: Sand worm

Scientific Name: *Nereis virens*

Lot Number: NV-040 Source: ARO

Acclimation: < 24 hours Age: Adult

Organisms Transferred (date, time, initials): 10/5/10, 1110, MKC, KAS

Treatment	Replicate	Number of Organisms Loaded
CONTROL	A	5 5 5 5 5
	B	5 5 5 5 5
	C	6 5 5 5 5
AT0-649	A	5 5 5 5 5
	B	5 5 5 5 5
	C	5 5 5 5 5
	D	5 5 5 5 5
	E	5 5 5 6 5
AT0-650	A	5 5 5 5 5
	B	5 5 5 5 5
	C	5 5 5 5 5
	D	5 5 5 5 5
	E	6 5 5 5 5

SEDIMENT TOXICITY TEST OBSERVATION DATA SHEET

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050
Test Material(s): SEDIMENT
Accession Number(s): AT0-649, AT0-650
Overlying Water: 30 PPT Crystal Sea
Accession Number: _____

TEST ORGANISM
Common Name: Sand Worm
Scientific Name: *Nereis virens*

TEST TYPE: **Static** / Flowthrough
Renewal / Non-renewal
Photoperiod: 8d/16l Light Intensity: 50 - 100 fc

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015
Test Container: 10 gal aquarium
Test Volume: 5 L sed / 7 gal water
Test Duration: 28 days

Treatment	Rep	Number Loaded	Number removed													Total Removed	Total Recovered
		Day 0 Date 10/5	Day 1 Date	Day 3 Date	Day 6 Date	Day 8 Date	Day 10 Date	Day 13 Date	Day 15 Date	Day 17 Date	Day 20 Date	Day 22 Date	Day 24 Date	Day 27 Date			Day 28 Date 11/2
CONTROL	A	25															25
	B	25															25
	C	25															25
AT0-649	A	25															25
	B	25															25
	C	25															25
	D	25															25
	E	25															25
AT0-650	A	25															25
	B	25															25
	C	25															25
	D	25															25
	E	25															25
Time/Initials		1110, MKC, WKS															1015

EPA Test Method: (FW) EPA 600-R-99-064/SW EPA-600-R-94-025 (CHECK ONE)

Hyallela:(100.1) _____ Chironomus(100.2) _____ Lumbriculus (100.3) _____ Leptocheirus, Eohaustorius & Ampelisca (100.4) _____

ATS-T72
12/03/08

TOXICITY TEST WATER QUALITY DATA SHEET - NEW SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050

TEST ORGANISM
Common Name: Sand worm
Scientific Name: *Nereis virens*

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015

TARGET VALUES: Temp: 20 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6
CONTROL		19.3							8.0							6.8							31.1						
AT0-649		19.2							8.1							5.1							30.0						
AT0-650		19.0							8.2							7.0							30.3						
Meter Number		674							674							674							674						
Time		1020							1020							1020							1020						
Initials		MK							MK							MK							MK						

ATS-T13
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050

TEST ORGANISM
Common Name: Sand worm
Scientific Name: *Nereis virens*

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015

TARGET VALUES Temp: 20 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 ℓ, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
CONTROL		19.0		19.0			19.4		7.8		7.5			7.2		6.2		6.8			5.6		31.3		31.2			30.5	
AT0-649		19.0		19.3			19.2		7.8		7.5			7.5		5.7		5.6			5.7		29.7		29.4			30.1	
AT0-650		19.1		19.2			19.1		8.0		7.6			7.5		6.5		7.1			6.0		30.4		30.8			31.0	
Meter Number		674		674			674		674		674			674		674		674			674		674		674			674	
Time		1020		0753			0920		1020		0753			0920		1020		0753			0920		1020		0753			0920	
Initials		JR		MK			ML		JR		MK			ML		JR		MK			ML		JR		MK			ML	

ATS-T14
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050

TEST ORGANISM
Common Name: Sand worm
Scientific Name: *Nereis virens*

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015

TARGET VALUES Temp: 20 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)							
		8	9	10	11	12	13	14	8	9	10	11	12	13	14	8	9	10	11	12	13	14	8	9	10	11	12	13	14	
CONTROL		19.4		18.9			19.3		8.1		8.2			7.3		6.8		6.4		~~6.8~~	6.8		31.0		31.5		~~30.2~~	30.2		10/11 MB
									5																					
AT0-649		19.0		18.9			19.2		8.1		8.0			7.4		6.5		5.4			6.3		30.1		31.0		~~3~~	30.2		10/18 MB
AT0-650		18.9		18.8			19.0		8.3		8.1			7.7		7.3		6.5			6.5		31.3		31.5			30.5		
Meter Number		675		675			674		675		675			674		675		675			674		675		675			674		
Time		1000		0945			1130		1000		0945			1130		1000		0945			1130		1000		0945			1130		
Initials		ML		ML			ML		ML		ML			ML		ML		ML			ML		ML		ML			ML		

ATS-T16
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050

TEST ORGANISM
Common Name: Sand Worm
Scientific Name: *Nereis virens*

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015

TARGET VALUES Temp: 20 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 ℓ, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	19	20	21
CONTROL		19.8	~~19.~~	19.5			20.2		7.9		8.1			8.1		8.0		6.7			6.5		31.7		30.6			30.5	
AT0-649		19.8		19.5			20.2		7.8		8.1			8.2		8.2		6.6			6.3		31.5		30.8			30.5	
AT0-650		19.7		19.6			20.2		7.9		8.1			8.2		8.2		6.3			6.3		31.7		30.9			30.3	
Meter Number		674		675			675		674		675			675		674		675			675		674		675			675	
Time		0835		1310			0832		0835		1310			0832		0835		1310			0832		0835		1310			0832	
Initials		PJS		MD			PJS		PJS		MD			PJS		PJS		MD			PJS		PJS		MD			PJS	

ATS-T18
06/21/06

Transcribed 10/25 WAS

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1050

TEST ORGANISM
Common Name: Sand worm
Scientific Name: *Nereis virens*

Beginning Date: 10/5/10 Time: 1110
Ending Date: 11/2/10 Time: 1015

TARGET VALUES Temp: 20 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 20 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		22	23	24	25	26	27	28	22	23	24	25	26	27	28	22	23	24	25	26	27	28	22	23	24	25	26	27	28
CONTROL		20.3		19.2			18.0	19.3	8.0		8.0			8.3	8.3	6.5		6.5			6.0	7.1	30.8		30.8			31.7	30.4
AT0-649		20.3		19.2			18.2	19.2	7.9		8.1			8.2	8.4	6.5		6.2			5.6	7.2	31.2		30.9			31.5	30.8
AT0-650		20.2		19.2			18.2	19.0	8.0		8.2			8.2	8.2	6.7		6.9			5.9	7.1	31.0		30.1			31.9	30.7
Meter Number		674		675			675	675	674		675			675	675	674		675			675	675	674		675			675	675
Time		0900		0830			0900	0932	0900		0830			0900	0932	0900		0830			0900	0932	0900		0830			0900	0932
Initials		MD		CM			MC	CMF	MD		CM			MC	CMF	MD		CM			MC	CMF	MD		CM			MC	CMF

ATS-T20
06/21/06

TOXICOLOGY LABORATORY BENCH SHEET - RENEWAL RECORD

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1050

Day	Date	Time	Initials
0			
1	10/6/10	1100	MKC
2			
3	10/8/10	0910	MKC
4			
5			
6	10/11/10	1000	ML
7			
8	10/13/10	1050	ML
9			
10	10-15-10	1100	ML
11			
12			
13	10-18-10	1300	R
14			
15	10-20-10	0850	R
16			
17	10/22/10	1430	CH/MD
18			
19			
20	10-25-10	1015	R
21			
22	10/27/10	1350	MKC
23			
24	10/29/10	1000	ML
25			
26			
27			
28			

QC Test: TN-10-1050 AT0-650 Coke Point DMCF *Sand Worm*

	Temperature		pH		DO		Salinity	
	New	Old	New	Old	New	Old	New	
1	19.0	19.1	8.2	8.0	7.0	6.5	30.3	30.4
2		19.2		7.6		7.1		30.8
3		19.1		7.5		6.0		31.0
4		18.9		8.3		7.3		31.3
5		18.8		8.1		6.5		31.5
6		19.0		7.7		6.8		30.5
7		19.7		7.9		8.2		31.7
8		19.6		8.1		6.3		30.9
9		20.2		8.2		6.3		30.3
10		20.2		8.0		6.7		31.0
11		19.2		8.2		6.9		30.1
12		18.2		8.2		5.9		31.9
13		19.0		8.2		7.1		30.7
14								
N		14		14		14		14.0
Min.		18.2		7.5		5.9		30.1
Max.		20.2		8.3		8.2		31.9
Mean		19.2		8.0		6.8		30.9
S.D.		0.54		0.25		0.59		0.6

Mae
12/30/10

QC Test: TN-10-1050 AT0-682 Control Coke Point DMCF *Sand Worm*

	Temperature		pH		DO		Salinity	
	New	Old	New	Old	New	Old	New	
1	19.3	19.0	8.0	7.8	6.8	6.2	31.1	31.3
2		19.0		7.5		6.8		31.2
3		19.4		7.2		5.6		30.5
4		19.4		8.1		6.8		31.0
5		18.9		8.2		6.4		31.5
6		19.3		7.3		6.8		30.2
7		19.8		7.9		8.0		31.7
8		19.5		8.1		6.7		30.6
9		20.2		8.1		6.5		30.5
10		20.3		8.0		6.5		30.8
11		19.2		8.0		6.5		30.8
12		18.0		8.3		6.0		31.7
13		19.3		8.3		7.1		30.4
14								
N		14		14		14		14.0
Min.		18.0		7.2		5.6		30.2
Max.		20.3		8.3		8.0		31.7
Mean		19.3		7.9		6.6		31.0
S.D.		0.56		0.35		0.55		0.5

Vae
12/30/10

QC Test: TN-10-1050 AT0-649 Coke Point DMCF *Sand Worm*

	Temperature		pH		DO		Salinity	
	New	Old	New	Old	New	Old	New	
1	19.2	19.0	8.1	7.8	5.1	5.7	30.0	29.7
2		19.3		7.5		5.6		29.4
3		19.2		7.5		5.7		30.1
4		19.0		8.1		6.5		30.1
5		18.9		8.0		5.4		31.0
6		19.2		7.4		6.3		30.2
7		19.8		7.8		8.2		31.5
8		19.5		8.1		6.6		30.8
9		20.2		8.2		6.3		30.5
10		20.3		7.9		6.5		31.2
11		19.2		8.1		6.2		30.9
12		18.2		8.2		5.6		31.5
13		19.2		8.4		7.2		30.8
14								
N		14		14		14		14.0
Min.		18.2		7.4		5.1		29.4
Max.		20.3		8.4		8.2		31.5
Mean		19.3		7.9		6.2		30.6
S.D.		0.53		0.30		0.81		0.7

12/30/10

ATTACHMENT III

Macoma nasuta 28-Day Solid Phase Bioaccumulation Testing
Data Sheets and Statistical Analyses
(16 pages)

SEDIMENT TOXICITY TEST SET-UP BENCH SHEET

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1051

TEST ORGANISM INFORMATION

Common Name: Blunt nose clam

Scientific Name: *Macoma nasuta*

Lot Number: MA-033

Source: ARO

Adults Isolated (Time, Date): _

Neonates Pulled (Time, Date): _____

Acclimation: 24 hours Age: Adult

Culture Water (T/S): 12.4 °C 28.8 ppt

TEST INITIATION

Date	Time	Initials	Activity
10/4/10	1115	WLM, WAS, MKC	Sediment Added to Chambers
10/4/10	1410	MKC	Overlying Water Added to Chambers
10/6/10	0852	MKC, WAS	Organisms Transferred

TEST SET-UP

Sample Number(s): AT0-649, AT0-650 (Reference), ATO-683 (Lab Control)

Overyling Water Number: 30 ppt Crystal Sea

Treatment	Volume Test Sediment	Volume Overlying Water
AT0-649	5 L	7 gal
AT0-650 (Reference)	↓	↓
AT0-683 (Lab Control)		

TOXICOLOGY LABORATORY BENCH SHEET - ORGANISM LOADING RECORD

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1051

TEST ORGANISM

Common Name: Blunt nose clam

Scientific Name: *Macoma nasuta*

Lot Number: MA-033 Source: ARO

Acclimation: 24 hours Age: Adult

Organisms Transferred (date, time, initials): 10/6/10, 0852, MKC, NAS

Treatment	Replicate	Number of Organisms Loaded
CONTROL	A	10 10 10 10 10 10 10 10 10 10
	B	10 10 10 10 10 10 10 10 10 10
	C	10 10 10 10 10 10 10 10 10 10
AT0-649	A	10 10 10 10 10 10 10 10 10 10
	B	10 10 10 10 10 10 10 10 10 10
	C	10 10 10 10 10 10 10 10 10 10
	D	10 10 10 10 10 10 10 10 10 10
	E	10 10 10 10 10 10 10 10 10 10
AT0-650	A	10 10 10 10 10 10 10 10 10 10
	B	10 10 10 10 10 10 10 10 10 10
	C	10 10 10 10 10 10 10 10 10 10
	D	10 10 10 10 10 10 10 10 10 10
	E	10 10 10 10 10 10 10 10 10 10

SEDIMENT TOXICITY TEST OBSERVATION DATA SHEET

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051
Test Material(s): SEDIMENT
Accession Number(s): AT0-649, AT0-650
Overlying Water: 30 PPT Crystal Sea
Accession Number: _____

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

TEST TYPE: **Static** / Flowthrough
Renewal / Non-renewal
Photoperiod: 8d/16l Light Intensity: 50 - 100 fc

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940
Test Container: 10 gal aquarium
Test Volume: 3 L sed / 7 gal water
Test Duration: 28 days

Treatment	Rep	Number Loaded	Number removed													Total Removed	Total Recovered
		Day 0 Date 10/6	Day 1 Date	Day 3 Date	Day ~~7~~ 7 Date	Day 8 Date	Day ~~10~~ 9 Date	Day ~~13~~ 14 Date	Day ~~15~~ 16 Date	Day 17 Date	Day ~~20~~ 21 Date	Day ~~22~~ 23 Date	Day ~~24~~ 25 Date	Day ~~27~~ ~~26~~ 28 Date			Day 28 Date 11/3
CONTROL	A	50						1			1	1	+				47
	B	50			1			III	II				1				42
	C	50									1	1					47
AT0-649	A	50															46
	B	50						IIII					1				41
	C	50															41
	D	50															43
	E	50										II	1				41
AT0-650	A	50						1	1				1				50
	B	50															47
	C	50										1					49
	D	50			1		1										47
	E	50						1					II				47
Time/Initials		0852/ MKC, MG			ML		ML	MD	MD		MKC	ML	ML 11-1 ML				0940

EPA Test Method: (FW) EPA 600-R-99-064/SW EPA-600-R-94-025 (CHECK ONE)

Hyallela:(100.1) _____ Chironomus(100.2) _____ Lumbriculus (100.3) _____ Leptocheirus, Eohaustorius & Ampelisca (100.4) _____

ATS-T72
12/03/08

TOXICITY TEST WATER QUALITY DATA SHEET - NEW SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940

TARGET VALUES: Temp: 12 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6
CONTROL		11.5							8.1							7.9							28.2						
AT0-649		11.3							8.1							7.7							27.5						
AT0-650		11.4							8.2							7.9							27.9						
Meter Number		674							674							674							674						
Time		0830							0830							0830							0830						
Initials		MKC							MKC							MKC							MKC						

ATS-T13
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940

TARGET VALUES Temp: 12 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 L, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C) 1	2	3	4	5	6	7	pH 1	2	3	4	5	6	7	Dissolved Oxygen (mg/L) 1	2	3	4	5	6	7	Salinity (ppt) 1	2	3	4	5	6	7
CONTROL			12.8			12.9		11.9		8.0			7.9		8.3		8.1			7.3		8.7		28.2			30.4		29.9
AT0-649			12.3			12.1		11.9		8.0			7.8		7.9		7.7			6.3		~~1.4~~ 7.7		27.4			29.8		29.9
AT0-650			11.9			12.1		11.7		8.0			7.9		8.0		7.9			7.2		6.8		30.5			30.0		30.5
Meter Number			674			674		675		674			674		675		674			674		675		674			674		675
Time			0820			0925		1010		0820			0925		1010		0820			0925		1010		0820			0925		1010
Initials			MD			mc		mc		MD			mc		mc		MD			mc		mc		MD			mc		mc

10/13 mc

ATS-T14
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940

TARGET VALUES Temp: 12 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 L, 8 D Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		8	9	10	11	12	13	14	8	9	10	11	12	13	14	8	9	10	11	12	13	14	8	9	10	11	12	13	14
CONTROL			11.7			12.4		12.9		8.3			7.8		8.0		7.4			7.9		8.2		30.7			29.5		32.1
AT0-649			11.6			12.1		12.3		8.2			7.8		7.9		7.2			7.6		8.0		30.4			29.3		31.8
AT0-650			11.6			11.8		12.3		8.2			7.9		8.3		7.4			7.8		8.0		30.8			30.0		32.0
Meter Number			675			674		674		675			674		674		675			674		674		675			674		674
Time			0950			1135		0840		0950			1135		0840		0950			1135		0840		0950			1135		0840
Initials			ML			ML		JL		ML			ML		JL		ML			ML		JL		ML			ML		JL

ATS-T16
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940

TARGET VALUES Temp: 12 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 30 ppt Photoperiod: 16 L, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	19	20	21	15	16	17	18	19	20	21
CONTROL			13.3			13.6		13.3		8.3			8.3		8.1		7.7			7.7		7.4		31.6			31.4		31.2
AT0-649			12.5			13.3		13.3		8.3			8.2		8.1		8.0			7.7		7.5		31.6			31.5		31.4
AT0-650			12.0			13.2		13.2		8.3			8.2		8.1		7.8			7.5		7.5		31.9			31.7		31.3
Meter Number			675			675		675		675			675		675		675			675		675		675			675		675
Time			1345			0843		0905		1345			0843		0905		1345			0843		0905		1345			0843		0905
Initials			MD			PJS		R		MD			PJS		R		MD			PJS		R		MD			PJS		R

ATS-T18
06/21/06

TOXICITY TEST WATER QUALITY DATA SHEET - OLD SOLUTIONS

Project Number: 70005.08
Client: COKE POINT DMCF
QC Test Number: TN-10-1051

TEST ORGANISM
Common Name: Blunt nose clam
Scientific Name: *Macoma nasuta*

Beginning Date: 10/6/10 Time: 0852
Ending Date: 11/3/10 Time: 0940

TARGET VALUES Temp: 12 °C pH: 6.0 - 9.0 DO: ≥2.5 mg/L Salinity: 20 ppt Photoperiod: 16 l, 8 d Light Intensity: 50 - 100 fc

Test Conc	Rep	Temperature (°C)							pH							Dissolved Oxygen (mg/L)							Salinity (ppt)						
		22	23	24	25	26	27	28	22	23	24	25	26	27	28	22	23	24	25	26	27	28	22	23	24	25	26	27	28
CONTROL			13.3			12.6		12.7		8.3			8.3		7.9		7.1			6.8		8.7		30.7			31.8		29.8
AT0-649			13.1			12.4		12.2		8.3			8.3		8.0		7.8			6.8		8.9		30.7			32.1		30.3
AT0-650			13.0			12.4		12.1		8.3			8.3		8.0		6.8			7.7		8.3		30.8			31.9		30.2
Meter Number			675			675		674		675			675		674		675			675		674		675			675		674
Time			0840			0915		1135		0840			0915		1135		0840			0915		1135		0840			0915		1135
Initials			CH			MC		PJS		CH			MC		PJS		CH			MC		PJS		CH			MC		PJS

ATS-T20
06/21/06

TOXICOLOGY LABORATORY BENCH SHEET - RENEWAL RECORD

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1051

Day	Date	Time	Initials
0			
1			
2	10/8/10	0930	MKL
3			
4			
5	10/11/10	1020	ML
6			
7	10/13/10	1105	ML
8			
9	10-15-10	1100	ML
10			
11			
12	10-18-10	1300	[illegible]
13			
14	10-20-10	0900	[illegible]
15			
16	10/22/10	1530	CH/MS
17			
18			
19	10-25-10	1130	[illegible]
20			
21	10/27/10	1350	MKL
22			
23	10/29/10	1000	ML
24			
25			
26			
27			
28			

TOXICOLOGY LABORATORY BENCH SHEET

Project Number: 70005.08

Client: COKE POINT DMCF

QC Test Number: TN-10-1051

Date/Time/Initials	Comments/Activity
10/13/10 1010 ML	(a) Air hose in ATO-649D fell out over night DO Dropped to 1.4 mg/L

Acute Survival Test-96 Hr Survival

Start Date:	10/6/2010	Test ID:	TN-10-1051	Sample ID:	
End Date:	11/3/2010	Lab ID:		Sample Type:	SEDIMENT
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	MA-Macoma nasuta
Comments:	COKE POINT				

Conc-%	1	2	3	4	5
AT0-650	1.0000	0.9400	0.9800	0.9400	0.9400
AT0-649	0.9200	0.8200	0.8200	0.8600	0.8200
CONTROL	0.9400	0.8400	0.9400		

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
AT0-650	0.9600	1.0000	1.3798	1.3233	1.5000	5.891	5			
*AT0-649	0.8480	0.8833	1.1739	1.1326	1.2840	5.621	5	4.398	1.860	0.0871
CONTROL	0.9067	0.9444	1.2686	1.1593	1.3233	7.466	3			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.7851	0.781	0.9996	-0.6483
F-Test indicates equal variances (p = 0.70)	1.51771	23.1545		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences	0.03931	0.04078	0.10601	0.00548	0.00229	1, 8

Reviewed by: [illegible] 12/30/10

Test: AS-Acute Survival Test
Species: MA-Macoma nasuta
Sample ID:
Start Date: 10/6/2010 End Date: 11/3/2010

Test ID: TN-10-1051
Protocol: EPAA 91-EPA Acute
Sample Type: SEDIMENT
Lab ID:

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	28-Day	Notes
	1	1	AT0-650	50				50	
	2	2	AT0-650	50				47	
	3	3	AT0-650	50				49	
	4	4	AT0-650	50				47	
	5	5	AT0-650	50				47	
	6	1	AT0-649	50				46	
	7	2	AT0-649	50				41	
	8	3	AT0-649	50				41	
	9	4	AT0-649	50				43	
	10	5	AT0-649	50				41	
	11	1	CONTROL	50				47	
	12	2	CONTROL	50				42	
	13	3	CONTROL	50				47	

Comments: COKE POINT

ToxCalc 5.0

Reviewed by: Nae 12/30/10

QC Test: TN-10-1051 AT0-683 Control Coke Point DMCF *M. nasuta*

	Temperature		pH		DO		Salinity
	New	Old	New	Old	New	Old	New
1	11.5	12.8	8.1	8.0	7.9	8.1	28.2
2		12.9		7.9		7.3	30.4
3		11.9		8.3		8.7	29.9
4		11.7		8.3		7.4	30.7
5		12.4		7.8		7.9	29.5
6		12.9		8.0		8.2	32.1
7		13.3		8.3		7.7	31.6
8		13.6		8.3		7.7	31.4
9		13.3		8.1		7.4	31.2
10		13.3		8.3		7.1	30.7
11		12.6		8.3		6.8	31.8
12		12.7		7.9		8.7	29.8
13							
14							
N		13		13		13	13.0
Min.		11.5		7.8		6.8	28.2
Max.		13.6		8.3		8.7	32.1
Mean		12.7		8.1		7.8	30.4
S.D.		0.66		0.19		0.57	1.3

12/30/10

QC Test: TN-10-1051 AT0-649 Coke Point DMCF *M. nasuta*

	Temperature		pH		DO		Salinity	
	New	Old	New	Old	New	Old	New	
1	11.3	12.3	8.1	8.0	7.7	7.7	27.5	27.4
2		12.1		7.8		6.3		29.8
3		11.9		7.9		7.7		29.4
4		11.6		8.2		7.2		30.4
5		12.1		7.8		7.6		29.3
6		12.3		7.9		8.0		31.8
7		12.5		8.3		8.0		31.6
8		13.3		8.2		7.7		31.5
9		13.3		8.1		7.5		31.4
10		13.1		8.3		7.8		30.7
11		12.4		8.3		6.8		32.1
12		12.2		8.0		8.9		30.3
13								
14								
N		13		13		13		13.0
Min.		11.3		7.8		6.3		27.4
Max.		13.3		8.3		8.9		32.1
Mean		12.3		8.1		7.6		30.2
S.D.		0.61		0.18		0.62		1.5

12/30/00

QC Test: TN-10-1051 AT0-650 Coke Point DMCF *M. nasuta*

	Temperature		pH		DO		Salinity	
	New	Old	New	Old	New	Old	New	
1	11.4	11.9	8.2	8.0	7.9	7.9	27.9	30.5
2		12.1		7.9		7.2		30.0
3		11.7		8.0		6.8		30.5
4		11.6		8.2		7.4		30.8
5		11.8		7.9		7.8		30.0
6		12.3		8.3		8.0		32.0
7		12.0		8.3		7.8		31.9
8		13.2		8.2		7.5		31.7
9		13.2		8.1		7.5		31.3
10		13.0		8.3		6.8		30.8
11		12.4		8.3		7.7		31.9
12		12.1		8.0		8.3		30.2
13								
14								
N		13		13		13		13.0
Min.		11.4		7.9		6.8		27.9
Max.		13.2		8.3		8.3		32.0
Mean		12.2		8.1		7.6		30.7
S.D.		0.60		0.15		0.45		1.1

12/30/16

ATTACHMENT IV

Report Quality Assurance Record
(2 pages)

REPORT QUALITY ASSURANCE RECORD

Client: Maryland Port Administration Project Number: 70005.08

Author: Virginia A. Sohn EA Report Number: 6116

REPORT CHECKLIST

QA/QC ITEM	REVIEWER	DATE
1. Samples collected, transported, and received according to study plan requirements.	Virginia A Sohn	12/15/10
2. Samples prepared and processed according to study plan requirements.	Virginia A Sohn	12/15/10
3. Data collected using calibrated instruments and equipment.	Virginia A Sohn	12/15/10
4. Calculations checked:		
- Hand calculations checked	Virginia A Sohn	12/15/10
- Documented and verified statistical procedure used.	Virginia A Sohn	12/15/10
5. Data input/statistical analyses complete and correct.	Richard A. Connelly	12/30/10
6. Reported results and facts checked against original sources.	Richard A. Connelly	12/30/10
7. Data presented in figures and tables correct and in agreement with text.	Richard A. Connelly	12/30/10
8. Results reviewed for compliance with study plan requirements.	Virginia A Sohn	12/15/10

	AUTHOR	DATE
9. Commentary reviewed and resolved.	Virginia A Sohn	1/6/11

10. All study plan and quality assurance/control requirements have been met and the report is approved:

Virginia A Sohn — 1/6/11
PROJECT MANAGER — DATE

Richard A. Connelly — 12/30/10
QUALITY CONTROL OFFICER — DATE

[illegible] — 1/6/11
SENIOR TECHNICAL REVIEWER — DATE

Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
CP-MOAM-001	Fish - White Perch	Coke Point Offshore Area	9/21/2010	194	100	CP-MOAM-WB-C
CP-MOAM-002	Fish - White Perch	Coke Point Offshore Area	9/21/2010	200	108	CP-MOAM-WB-E
CP-MOAM-003	Fish - White Perch	Coke Point Offshore Area	9/21/2010	186	94	CP-MOAM-WB-B
CP-MOAM-004	Fish - White Perch	Coke Point Offshore Area	9/21/2010	212	145	CP-MOAM-FT-B
CP-MOAM-005	Fish - White Perch	Coke Point Offshore Area	9/21/2010	217	154	CP-MOAM-FT-C
CP-MOAM-006	Fish - White Perch	Coke Point Offshore Area	9/21/2010	207	129	CP-MOAM-FT-B
CP-MOAM-007	Fish - White Perch	Coke Point Offshore Area	9/21/2010	225	179	CP-MOAM-FT-E
CP-MOAM-008	Fish - White Perch	Coke Point Offshore Area	9/21/2010	223	161	CP-MOAM-FT-D
CP-MOAM-009	Fish - White Perch	Coke Point Offshore Area	9/21/2010	213	154	CP-MOAM-FT-C
CP-MOAM-010	Fish - White Perch	Coke Point Offshore Area	9/21/2010	191	98	CP-MOAM-WB-B
CP-MOAM-011	Fish - White Perch	Coke Point Offshore Area	9/21/2010	200	115	CP-MOAM-WB-E
CP-MOAM-012	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	100	CP-MOAM-WB-C
CP-MOAM-013	Fish - White Perch	Coke Point Offshore Area	9/21/2010	176	80	CP-MOAM-WB-A
CP-MOAM-014	Fish - White Perch	Coke Point Offshore Area	9/21/2010	174	76	CP-MOAM-WB-A
CP-MOAM-015	Fish - White Perch	Coke Point Offshore Area	9/21/2010	182	90	CP-MOAM-WB-A
CP-MOAM-016	Fish - White Perch	Coke Point Offshore Area	9/21/2010	210	148	CP-MOAM-FT-B
CP-MOAM-017	Fish - White Perch	Coke Point Offshore Area	9/21/2010	220	150	CP-MOAM-FT-D
CP-MOAM-018	Fish - White Perch	Coke Point Offshore Area	9/21/2010	217	144	CP-MOAM-FT-D
CP-MOAM-019	Fish - White Perch	Coke Point Offshore Area	9/21/2010	216	163	CP-MOAM-FT-C
CP-MOAM-020	Fish - White Perch	Coke Point Offshore Area	9/21/2010	235	184	CP-MOAM-FT-E
CP-MOAM-021	Fish - White Perch	Coke Point Offshore Area	9/21/2010	238	209	CP-MOAM-FT-E
CP-MOAM-022	Fish - White Perch	Coke Point Offshore Area	9/21/2010	197	104	CP-MOAM-WB-D
CP-MOAM-023	Fish - White Perch	Coke Point Offshore Area	9/21/2010	196	115	CP-MOAM-WB-D
CP-MOAM-024	Fish - White Perch	Coke Point Offshore Area	9/21/2010	195	119	CP-MOAM-WB-D
CP-MOAM-025	Fish - White Perch	Coke Point Offshore Area	9/21/2010	190	87	CP-MOAM-WB-B
CP-MOAM-026	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	97	CP-MOAM-WB-C
CP-MOAM-027	Fish - White Perch	Coke Point Offshore Area	9/21/2010	197	108	CP-MOAM-WB-E
CP-MOAM-028	Fish - White Perch	Coke Point Offshore Area	9/21/2010	206	126	CP-MOAM-FT-A*
CP-MOAM-029	Fish - White Perch	Coke Point Offshore Area	9/21/2010	205	128	CP-MOAM-FT-A*
CP-MOAM-030	Fish - White Perch	Coke Point Offshore Area	9/21/2010	206	123	CP-MOAM-FT-A*
CP-MOAM-031	Fish - White Perch	Coke Point Offshore Area	9/21/2010	192	109	CP-MOAM-FT-A
CP-MOAM-032	Fish - White Perch	Coke Point Offshore Area	9/21/2010	198	122	CP-MOAM-FT-A
CP-MOAM-033	Fish - White Perch	Coke Point Offshore Area	9/21/2010	211	138	CP-MOAM-FT-A
PR-MOAM-001	Fish - White Perch	Patapsco River Background Area	9/23/2010	190	120	PR-MOAM-WB-D
PR-MOAM-002	Fish - White Perch	Patapsco River Background Area	9/23/2010	211	132	PR-MOAM-FT-B
PR-MOAM-003	Fish - White Perch	Patapsco River Background Area	9/23/2010	170	69	PR-MOAM-WB-A
PR-MOAM-004	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	81	PR-MOAM-WB-B
PR-MOAM-005	Fish - White Perch	Patapsco River Background Area	9/23/2010	255	257	PR-MOAM-FT-E
PR-MOAM-006	Fish - White Perch	Patapsco River Background Area	9/23/2010	213	155	PR-MOAM-FT-B
PR-MOAM-007	Fish - White Perch	Patapsco River Background Area	9/23/2010	209	113	PR-MOAM-FT-A
PR-MOAM-008	Fish - White Perch	Patapsco River Background Area	9/23/2010	171	67	PR-MOAM-WB-A
PR-MOAM-009	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	78	PR-MOAM-WB-B
PR-MOAM-010	Fish - White Perch	Patapsco River Background Area	9/23/2010	193	111	PR-MOAM-WB-D
PR-MOAM-011	Fish - White Perch	Patapsco River Background Area	9/23/2010	254	256	PR-MOAM-FT-E
PR-MOAM-012	Fish - White Perch	Patapsco River Background Area	9/23/2010	175	77	PR-MOAM-WB-C
PR-MOAM-013	Fish - White Perch	Patapsco River Background Area	9/24/2010	217	180	PR-MOAM-FT-C
PR-MOAM-014	Fish - White Perch	Patapsco River Background Area	9/24/2010	175	101	PR-MOAM-WB-C
PR-MOAM-015	Fish - White Perch	Patapsco River Background Area	9/24/2010	174	86	PR-MOAM-WB-A
PR-MOAM-016	Fish - White Perch	Patapsco River Background Area	9/24/2010	178	95	PR-MOAM-WB-C
PR-MOAM-017	Fish - White Perch	Patapsco River Background Area	9/24/2010	174	87	PR-MOAM-WB-B
PR-MOAM-018	Fish - White Perch	Patapsco River Background Area	9/29/2010	227	176	PR-MOAM-WB-E
PR-MOAM-019	Fish - White Perch	Patapsco River Background Area	9/29/2010	243	227	PR-MOAM-WB-E
PR-MOAM-020	Fish - White Perch	Patapsco River Background Area	9/29/2010	210	146	PR-MOAM-FT-A
PR-MOAM-021	Fish - White Perch	Patapsco River Background Area	9/29/2010	212	148	PR-MOAM-FT-B
PR-MOAM-022	Fish - White Perch	Patapsco River Background Area	9/29/2010	224	187	PR-MOAM-FT-D
PR-MOAM-023	Fish - White Perch	Patapsco River Background Area	9/29/2010	215	147	PR-MOAM-FT-C
PR-MOAM-024	Fish - White Perch	Patapsco River Background Area	9/29/2010	247	231	PR-MOAM-WB-E
PR-MOAM-025	Fish - White Perch	Patapsco River Background Area	9/29/2010	254	253	PR-MOAM-FT-E
PR-MOAM-026	Fish - White Perch	Patapsco River Background Area	9/29/2010	217	172	PR-MOAM-FT-C
PR-MOAM-027	Fish - White Perch	Patapsco River Background Area	9/29/2010	219	142	PR-MOAM-FT-D
PR-MOAM-028	Fish - White Perch	Patapsco River Background Area	9/29/2010	222	183	PR-MOAM-FT-D
PR-MOAM-029	Fish - White Perch	Patapsco River Background Area	9/29/2010	204	137	PR-MOAM-FT-A
PR-MOAM-030	Fish - White Perch	Patapsco River Background Area	9/29/2010	200	121	PR-MOAM-WB-D
PR-MOAM-031	Fish - White Perch	Patapsco River Background Area	9/29/2010	198	--	PR-MOAM-FT-E-MS/MSD
PR-MOAM-032	Fish - White Perch	Patapsco River Background Area	9/29/2010	182	--	PR-MOAM-FT-E-MS/MSD
PR-MOAM-033	Fish - White Perch	Patapsco River Background Area	9/29/2010	195	--	PR-MOAM-FT-E-MS/MSD

Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
PR-CASA-001	Blue Crab	Patapsco River Background Area	10/5/2010	149	162	PR-CASA-MT-A, MU-A
PR-CASA-002	Blue Crab	Patapsco River Background Area	10/5/2010	153	185	PR-CASA-MT-A, MU-A
PR-CASA-003	Blue Crab	Patapsco River Background Area	10/5/2010	135	130	PR-CASA-MT-A, MU-A
PR-CASA-004	Blue Crab	Patapsco River Background Area	10/5/2010	130	127	PR-CASA-MT-A, MU-A
PR-CASA-005	Blue Crab	Patapsco River Background Area	10/5/2010	134	130	PR-CASA-MT-A, MU-A
PR-CASA-006	Blue Crab	Patapsco River Background Area	10/5/2010	124	126	PR-CASA-MT-A, MU-A
PR-CASA-007	Blue Crab	Patapsco River Background Area	10/5/2010	140	119	PR-CASA-MT-B, MU-B
PR-CASA-008	Blue Crab	Patapsco River Background Area	10/5/2010	153	231	PR-CASA-MT-B, MU-B
PR-CASA-009	Blue Crab	Patapsco River Background Area	10/5/2010	154	232	PR-CASA-MT-B, MU-B
PR-CASA-010	Blue Crab	Patapsco River Background Area	10/5/2010	153	180	PR-CASA-MT-B, MU-B
PR-CASA-011	Blue Crab	Patapsco River Background Area	10/5/2010	171	221	PR-CASA-MT-B, MU-B
PR-CASA-012	Blue Crab	Patapsco River Background Area	10/5/2010	143	136	PR-CASA-MT-B, MU-B
PR-CASA-013	Blue Crab	Patapsco River Background Area	10/5/2010	164	187	PR-CASA-MT-C, MU-C
PR-CASA-014	Blue Crab	Patapsco River Background Area	10/5/2010	155	152	PR-CASA-MT-C, MU-C
PR-CASA-015	Blue Crab	Patapsco River Background Area	10/5/2010	153	149	PR-CASA-MT-C, MU-C
PR-CASA-016	Blue Crab	Patapsco River Background Area	10/5/2010	161	165	PR-CASA-MT-C, MU-C
PR-CASA-017	Blue Crab	Patapsco River Background Area	10/5/2010	149	143	PR-CASA-MT-C, MU-C
PR-CASA-018	Blue Crab	Patapsco River Background Area	10/5/2010	162	145	PR-CASA-MT-C, MU-C
PR-CASA-019	Blue Crab	Patapsco River Background Area	10/5/2010	167	155	PR-CASA-MT-D, MU-D
PR-CASA-020	Blue Crab	Patapsco River Background Area	10/5/2010	154	118	PR-CASA-MT-D, MU-D
PR-CASA-021	Blue Crab	Patapsco River Background Area	10/5/2010	149	105	PR-CASA-MT-D, MU-D
PR-CASA-022	Blue Crab	Patapsco River Background Area	10/5/2010	147	106	PR-CASA-MT-D, MU-D
PR-CASA-023	Blue Crab	Patapsco River Background Area	10/5/2010	159	155	PR-CASA-MT-D, MU-D
PR-CASA-024	Blue Crab	Patapsco River Background Area	10/5/2010	151	134	PR-CASA-MT-D, MU-D
PR-CASA-025	Blue Crab	Patapsco River Background Area	10/5/2010	155	122	PR-CASA-MT-E, MU-E
PR-CASA-026	Blue Crab	Patapsco River Background Area	10/5/2010	135	123	PR-CASA-MT-E, MU-E
PR-CASA-027	Blue Crab	Patapsco River Background Area	10/5/2010	152	124	PR-CASA-MT-E, MU-E
PR-CASA-028	Blue Crab	Patapsco River Background Area	10/5/2010	145	119	PR-CASA-MT-E, MU-E
PR-CASA-029	Blue Crab	Patapsco River Background Area	10/5/2010	149	124	PR-CASA-MT-E, MU-E
PR-CASA-030	Blue Crab	Patapsco River Background Area	10/5/2010	150	123	PR-CASA-MT-E, MU-E
CP-CASA-001	Blue Crab	Coke Point Offshore Area	9/29/2010	155	122	CP-CASA-MT-A, MU-A
CP-CASA-002	Blue Crab	Coke Point Offshore Area	9/29/2010	169	133	CP-CASA-MT-A, MU-A
CP-CASA-003	Blue Crab	Coke Point Offshore Area	9/29/2010	163	125	CP-CASA-MT-A, MU-A
CP-CASA-004	Blue Crab	Coke Point Offshore Area	9/29/2010	170	133	CP-CASA-MT-A, MU-A
CP-CASA-005	Blue Crab	Coke Point Offshore Area	9/29/2010	159	157	CP-CASA-MT-A, MU-A
CP-CASA-006	Blue Crab	Coke Point Offshore Area	9/29/2010	170	156	CP-CASA-MT-A, MU-A
CP-CASA-007	Blue Crab	Coke Point Offshore Area	9/29/2010	153	100	CP-CASA-MT-B, MU-B
CP-CASA-008	Blue Crab	Coke Point Offshore Area	9/29/2010	155	106	CP-CASA-MT-B, MU-B
CP-CASA-009	Blue Crab	Coke Point Offshore Area	9/29/2010	155	105	CP-CASA-MT-B, MU-B
CP-CASA-010	Blue Crab	Coke Point Offshore Area	9/29/2010	154	97	CP-CASA-MT-B, MU-B
CP-CASA-011	Blue Crab	Coke Point Offshore Area	9/29/2010	154	126	CP-CASA-MT-B, MU-B
CP-CASA-012	Blue Crab	Coke Point Offshore Area	9/29/2010	154	113	CP-CASA-MT-B, MU-B
CP-CASA-013	Blue Crab	Coke Point Offshore Area	9/29/2010	167	181	CP-CASA-MU-B
CP-CASA-014	Blue Crab	Coke Point Offshore Area	9/29/2010	154	119	CP-CASA-MU-A
CP-CASA-015	Blue Crab	Coke Point Offshore Area	9/29/2010	153	104	--
CP-CASA-016	Blue Crab	Coke Point Offshore Area	9/29/2010	142	112	CP-CASA-MU-A
CP-CASA-017	Blue Crab	Coke Point Offshore Area	9/29/2010	148	99	--
CP-CASA-018	Blue Crab	Coke Point Offshore Area	9/29/2010	158	175	CP-CASA-MU-A
CP-CASA-019	Blue Crab	Coke Point Offshore Area	9/29/2010	146	113	CP-CASA-MU-A
CP-CASA-020	Blue Crab	Coke Point Offshore Area	9/29/2010	134	87	CP-CASA-MU-B
CP-CASA-021	Blue Crab	Coke Point Offshore Area	9/29/2010	141	104	CP-CASA-MU-B
CP-CASA-022	Blue Crab	Coke Point Offshore Area	9/29/2010	143	66	CP-CASA-MU-B
CP-CASA-023	Blue Crab	Coke Point Offshore Area	9/29/2010	140	83	CP-CASA-MU-B
CP-CASA-024	Blue Crab	Coke Point Offshore Area	9/29/2010	140	92	CP-CASA-MU-B
CP-CASA-025	Blue Crab	Coke Point Offshore Area	9/29/2010	161	119	CP-CASA-MU-B
CP-CASA-026	Blue Crab	Coke Point Offshore Area	9/29/2010	154	95	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-027	Blue Crab	Coke Point Offshore Area	9/29/2010	148	141	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-028	Blue Crab	Coke Point Offshore Area	9/29/2010	148	126	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-029	Blue Crab	Coke Point Offshore Area	9/29/2010	152	109	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-030	Blue Crab	Coke Point Offshore Area	9/29/2010	154	96	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-031	Blue Crab	Coke Point Offshore Area	9/29/2010	144	82	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-032	Blue Crab	Coke Point Offshore Area	9/29/2010	165	162	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-033	Blue Crab	Coke Point Offshore Area	9/29/2010	150	105	CP-CASA-MT-E & MS/MSD, MU-E
CP-CASA-034	Blue Crab	Coke Point Offshore Area	9/29/2010	167	181	CP-CASA-MT-C, MU-C
CP-CASA-035	Blue Crab	Coke Point Offshore Area	9/29/2010	154	119	CP-CASA-MT-C, MU-C
CP-CASA-036	Blue Crab	Coke Point Offshore Area	9/29/2010	153	104	CP-CASA-MT-C, MU-C

Attachment B
Table 1. Specimens for Tissue Testing Collected During Field Studies (Sept/Oct 2010)

Sample	Media	Area	Date Collected	Length (mm)	Weight (g)	Composite Sample Used In
EA Samples						
CP-CASA-037	Blue Crab	Coke Point Offshore Area	9/29/2010	142	112	CP-CASA-MT-C, MU-C
CP-CASA-038	Blue Crab	Coke Point Offshore Area	9/29/2010	148	99	CP-CASA-MT-C, MU-C
CP-CASA-039	Blue Crab	Coke Point Offshore Area	9/29/2010	158	175	CP-CASA-MT-C, MU-C
CP-CASA-040	Blue Crab	Coke Point Offshore Area	9/29/2010	148	129	CP-CASA-MU-C
CP-CASA-041	Blue Crab	Coke Point Offshore Area	9/29/2010	108	150	CP-CASA-MU-C
CP-CASA-042	Blue Crab	Coke Point Offshore Area	9/29/2010	152	137	CP-CASA-MU-C
CP-CASA-043	Blue Crab	Coke Point Offshore Area	9/29/2010	148	124	CP-CASA-MU-C
CP-CASA-044	Blue Crab	Coke Point Offshore Area	9/29/2010	153	112	CP-CASA-MU-C
CP-CASA-045	Blue Crab	Coke Point Offshore Area	9/29/2010	155	92	CP-CASA-MU-C
CP-CASA-046	Blue Crab	Coke Point Offshore Area	9/29/2010	153	132	CP-CASA-MU-C
CP-CASA-047	Blue Crab	Coke Point Offshore Area	9/29/2010	147	84	CP-CASA-MU-C
CP-CASA-048	Blue Crab	Coke Point Offshore Area	9/29/2010	137	83	CP-CASA-MU-C
CP-CASA-049	Blue Crab	Coke Point Offshore Area	9/29/2010	146	91	CP-CASA-MU-C
CP-CASA-050	Blue Crab	Coke Point Offshore Area	9/29/2010	148	95	CP-CASA-MU-C
CP-CASA-051	Blue Crab	Coke Point Offshore Area	9/29/2010	133	80	CP-CASA-MU-C
CP-CASA-052	Blue Crab	Coke Point Offshore Area	9/29/2010	142	79	CP-CASA-MU-C
CP-CASA-053	Blue Crab	Coke Point Offshore Area	9/29/2010	158	57	CP-CASA-MU-C
CP-CASA-054	Blue Crab	Coke Point Offshore Area	9/29/2010	143	60	CP-CASA-MU-C
CP-CASA-055	Blue Crab	Coke Point Offshore Area	9/29/2010	153	118	CP-CASA-MU-C
CP-CASA-056	Blue Crab	Coke Point Offshore Area	9/29/2010	150	89	CP-CASA-MU-C
CP-CASA-057	Blue Crab	Coke Point Offshore Area	9/29/2010	137	93	CP-CASA-MU-C
CP-CASA-058	Blue Crab	Coke Point Offshore Area	9/29/2010	144	75	CP-CASA-MU-C
CP-CASA-059	Blue Crab	Coke Point Offshore Area	9/29/2010	153	84	CP-CASA-MU-C
CP-CASA-060	Blue Crab	Coke Point Offshore Area	9/29/2010	140	90	CP-CASA-MU-C
CP-CASA-061	Blue Crab	Coke Point Offshore Area	9/29/2010	145	86	CP-CASA-MU-C
CP-CASA-062	Blue Crab	Coke Point Offshore Area	9/29/2010	146	113	CP-CASA-MT-D, MU-D
CP-CASA-063	Blue Crab	Coke Point Offshore Area	9/29/2010	134	87	CP-CASA-MT-D, MU-D
CP-CASA-064	Blue Crab	Coke Point Offshore Area	9/29/2010	141	104	CP-CASA-MT-D, MU-D
CP-CASA-065	Blue Crab	Coke Point Offshore Area	9/29/2010	143	66	CP-CASA-MT-D, MU-D
CP-CASA-066	Blue Crab	Coke Point Offshore Area	9/29/2010	140	83	CP-CASA-MT-D, MU-D
CP-CASA-067	Blue Crab	Coke Point Offshore Area	9/29/2010	140	92	CP-CASA-MT-D, MU-D
CP-CASA-068	Blue Crab	Coke Point Offshore Area	9/29/2010	161	119	CP-CASA-MT-D, MU-D
CP-CASA-069	Blue Crab	Coke Point Offshore Area	9/29/2010	155	93	CP-CASA-MT-D, MU-D
CP-CASA-070	Blue Crab	Coke Point Offshore Area	9/29/2010	145	95	CP-CASA-MU-D
CP-CASA-071	Blue Crab	Coke Point Offshore Area	9/29/2010	146	70	CP-CASA-MU-D
CP-CASA-072	Blue Crab	Coke Point Offshore Area	9/29/2010	138	77	CP-CASA-MU-D
CP-CASA-073	Blue Crab	Coke Point Offshore Area	9/29/2010	148	94	CP-CASA-MU-C
CP-CASA-074	Blue Crab	Coke Point Offshore Area	9/29/2010	148	94	CP-CASA-MU-C
CP-CASA-075	Blue Crab	Coke Point Offshore Area	9/29/2010	141	82	CP-CASA-MU-C
CP-CASA-076	Blue Crab	Coke Point Offshore Area	9/29/2010	153	70	CP-CASA-MU-C

*Original sample lost at the laboratotry, resampled on October 18, 2010.

Attachment B
Table 2. Tissue Composites Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
EA Samples								
CP-MOAM-WB-A	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-WB-B	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-WB-C	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-WB-D	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-WB-E	Fish Composite	Whole body	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-A	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-FT-B	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x	x	x
CP-MOAM-FT-C	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-D	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-MOAM-FT-E	Fish Composite	Fillet (by lab)	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-A	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-B	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MT-C	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-D	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-E	Crab Composite	Meat	Coke Point Offshore Area	x	x	x		x
CP-CASA-MT-EMS	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MT-EMSD	Crab Composite	Meat	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-A	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-B	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	x
CP-CASA-MU-C	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-D	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-E	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x		x
CP-CASA-MU-EMS	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
CP-CASA-MU-EMSD	Crab Composite	Mustard	Coke Point Offshore Area	x	x	x	x	
PR-MOAM-WB-A	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-WB-B	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-WB-C	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-D	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-E	Fish Composite	Whole body	Patapsco River Background Area	x	x	x		x
PR-MOAM-WB-EMS	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	
PR-MOAM-WB-EMSD	Fish Composite	Whole body	Patapsco River Background Area	x	x	x	x	
PR-MOAM-FT-A	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-FT-B	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	x
PR-MOAM-FT-C	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-D	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-E	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x		x
PR-MOAM-FT-EMS	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	
PR-MOAM-FT-EMSD	Fish Composite	Fillet (by lab)	Patapsco River Background Area	x	x	x	x	
PR-CASA-MT-A	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x

Attachment B
Table 2. Tissue Composites Collected During Field Studies

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids (TestAmerica SOP)
PR-CASA-MT-B	Crab Composite	Meat	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MT-C	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-D	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MT-E	Crab Composite	Meat	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-A	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-B	Crab Composite	Mustard	Patapsco River Background Area	x	x	x	x	x
PR-CASA-MU-C	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-D	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
PR-CASA-MU-E	Crab Composite	Mustard	Patapsco River Background Area	x	x	x		x
INTRA-LAB BLANK	Rinse blank	Rinsate	Quality Control	x	x	x		
Field Total				48	48	48	24	40
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-3	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-4	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Fish Composite	Whole body	Laboratory Control	x	x	x	x	
LABDUP2	Fish Composite	Fillet (by lab)	Laboratory Control	x	x	x	x	
LABDUP3	Crab Composite	Meat	Laboratory Control	x	x	x	x	
LABDUP4	Crab Composite	Mustard	Laboratory Control	x	x	x	x	
Field Total				8	4	4	4	0
Total				**56**	**52**	**52**	**28**	**40**

Attachment B
Table 3. Sediment Samples Collected During Field Studies

Sample	Media	Type	Area	Metals (SW846 6020, SW846 7471A)	SVOCs & PAHs (SW846 8270)	PCB Congeners (SW846 8082)	Grain size (ASTM D422)	TOC (Lloyd Kahn)	Hexavalent Chromium
EA Samples									
BH-SED-03C-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-03-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
BH-SED-10-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
SP09-02-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
S-B1-00-10A	Sediment	Grab samples	Coke Point Offshore Area	x	x	x	x		
CP-SED-COMP	Sediment	Composite	Coke Point Offshore Area	x	x	x	x		x
CP-SED-COMP-MS	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
CP-SED-COMP-MSD	Sediment	Grab samples	Coke Point Offshore Area	x	x	x			x
EH2-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH3-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
EH4-00-10	Sediment	Grab samples	Patapsco River Background Area	x	x	x	x		
PR-SED-COMP	Sediment	Composite	Patapsco River Background Area	x	x	x	x		x
LAB-SED-COMP	Sediment	Control	Control Sample (lab control & pre-test)	x	x	x	x		
Rinse Blank	Rinsate	Rinse blank	Quality Control	x	x	x			
Lab Total				13	13	13	11	0	4
Lab Samples									
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x	x	x			
Field Total				2	2	2	0	0	0
Total				**15**	**15**	**15**	**11**	**0**	**4**

Attachment B
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
EA Samples								
CP-CLAM-01	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-01MS	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-01MSD	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-CLAM-02	Clam	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-CLAM-03	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-04	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-CLAM-05	Clam	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-01	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-01MS	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-01MSD	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	
CP-WORM-02	Worm	Whole body	Coke Point Offshore Area	x	x	x	x	x
CP-WORM-03	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-04	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
CP-WORM-05	Worm	Whole body	Coke Point Offshore Area	x	x	x		x
PR-CLAM-01	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-02	Clam	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-CLAM-03	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-04	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-CLAM-05	Clam	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-01	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-02	Worm	Whole body	Patapsco River Background Area	x	x	x	x	x
PR-WORM-03	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-04	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PR-WORM-05	Worm	Whole body	Patapsco River Background Area	x	x	x		x
PRETEST-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-01	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-02	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-CLAM-03	Clam	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
PRETEST-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x

Attachment B
Table 4. Bioaccumulation Study Samples for Laboratory Analysis

Sample	Media	Tissue Type	Area	Metals (SW846 6020, SW846 7471A)	PAHs (SW846 8270 SIM)	PCB Congeners (SW846 8082)	Arsenic Speciation (EPA 1632)	Lipids & Percent Moisture (TestAmerica SOPs)
PRETEST-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x	x	x
PRETEST-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-01	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-02	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
CTRL-WORM-03	Worm	Whole body	Control Sample (lab control & pre-test)	x	x	x		x
Lab Total				36	36	36	16	32
Lab Samples								
SRM-1	Standard Ref. Mat.	SRM	Laboratory Control	x				
SRM-2	Standard Ref. Mat.	SRM	Laboratory Control	x				
LABDUP1	Clam	Control	Laboratory Control					x
LABDUP2	Worm	Control	Laboratory Control					x
Field Total				2	0	0	0	2
Total				**38**	**36**	**36**	**16**	**34**

APPENDIX I

RESPONSE TO COMMENTS

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APPENDIX I

Response to Comments on the Draft Final Risk Assessment of Offshore Areas Adjacent to the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point, February 10, 2011

Comments received from U.S. EPA 28 March 2011

Comment 1: Scenario 1 of this HHRA contains too much uncertainty in light of the actual data available for Scenario 2 to be considered seriously. Applying the bioaccumulation factors calculated from essentially stationary species (clam and worm) sediment exposure to migratory crabs is simply inaccurate, and literature bioconcentration factors applied to fish are inaccurate estimates compared to actual tissue data from the site. Scenario 2 is more certain because actual tissue concentrations of fish and crab caught in the area are used. While these species are more wide-ranging than the Turning Basin and Coke Point offshore area, there are no alternative sedentary species in the area that are human consumption targets. It is recommended that only Scenario 2 be considered by the Agencies.

Response: *As stated in the comment above Scenario 2 is considered more appropriate by USEPA and MDE as a basis for decision making. The human health risk assessment will rename this scenario and focus on its relevance to public health. The previous Scenario 2 will be presented as a "Risk Assessment for Public Health and Ecological Impact". This scenario will thus be presented as the primary assessment relevant to public health concerns based upon present conditions within the Coke Point Area. Further comments by USEPA and MDE addressing methods of analysis will be incorporated as discussed below. The risk assessment as designed and carried out also has the objective of supporting the planning process for potential development of a Dredged Material Containment Facility. To achieve objective analysis more limited to the site itself are necessary. These analyses will be presented separately. Thus Scenario 1 will be renamed "Risk Assessment as a Basis for Source Characterization and Site Planning." This scenario will be presented as a more localized assessment relevant to potential benefits from and requirements for risk reduction through site development planning. Results for these two scenarios will be presented separately in the human health risk assessment section and in the conclusions, with text discussing their relevance and regulatory context.*

We would like to clarify that the estimates of risk from the use of bioaccumulation factors (BAFs) for fish and crab are not strictly "inaccurate" but is a standard estimating method that is often used in lieu of field collected data. In this case the approach is applied to help determine contributions of Coke Point sediment and surface water to fish and crab that may use the area. This

determination is a well established means of linking observed risks to food chain bioaccumulation that has been used at numerous sites. For most chemicals, site-specific BAFs are used, providing a highly relevant and technically defensible method of quantifying bioaccumulation. The use of a non-site specific BAFs is a well documented and well established practice utilized in risk assessments and environmental standards produced by the U.S. EPA (e.g. NAWQC, EPA Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities).

Comment 2: The unacceptable cumulative carcinogenic risk for all Scenario 2 Coke Point Offshore Area receptors is driven solely by dermal absorption of PAHs during surface water exposure, which is swimming for the recreational receptors and 8-hour long, 39 days per year immersion of hands and arms for the waterman receptor. Even though the exposure area is restricted to the Turning Basin and up to 1,000 ft offshore of the remaining Coke Point shoreline, it is assumed that the recreational swimmers will swim at these locations for 2 hours per event, each weekend day all summer long. These assumptions are in opposition to the likelihood that offshore Coke Point and the Turning Basin probably never attract any recreational swimmers. Further, no fishing activity results in 8-hour immersion of the hands and arms. In addition, since only approximately 20 of the 96 surface water samples had cancer risk-driving PAH detections, distribution of the elevated PAH surface water concentrations should have been evaluated in assessing exposure. The Uncertainty Section 5.7.4 notes that the U.S. EPA dermal equations (2004) for water exposure produce probable over-estimation for chemicals with large partition coefficient values, such as PAHs. Therefore, the risk driving exposure is unlikely, probably over-estimated, and spatially limited. In light of this, it is important to note that the majority of the risk estimates for fish and crab consumption are virtually identical for the Coke Point Offshore Area and Patapsco River Background Area, except for the non-cancer estimates for Coke Point crab consumption, which are higher than Background but still acceptable. The concluding statement of the Summary Section 5.8, that "All complete exposure pathways reveal elevated risk concerns for human exposure to Coke Point Offshore Area" is erroneous.

Response: *As noted in Response to Comment 1, the HHRA will contain two exposure scenarios called "Risk Assessment for Public Health and Ecological Impact" and "Risk Assessment as a Basis for Source Characterization and Corrective Action Decision-Making." The public health/ecological impact assessment will present a public health analysis that models exposures more in keeping with the above recommendations by the U.S. EPA. The U.S. EPA noted in the comment "These assumptions are in opposition to the likelihood that offshore Coke Point and the*

Turning Basin probably never attract any recreational swimmers". Therefore, potential swimming exposures for recreational users will be greatly reduced but will not be removed from the public health assessment, with swimming exposures based on precedent set by previous RCRA documentation. The RCRA Documentation of Environmental Indicator Determination (ISG 2005) noted that recreational swimming is a possibility and evaluated surface water screening values for dermal contact. Input parameters used in this evaluation will be included in the HHRA scenario that evaluates public health, since U.S. EPA previously approved this analysis. As a result, the number of days for a recreational swimming scenario will be reduced to 4 days/year. U.S. EPA will be cited in the document as the source for the requested revision, and ISG 2005 cited as the source for the parameters.

The source characterization/corrective action assessment evaluated in the HHRA will estimate potential human health risks based upon an exposure frequency of 32 days/year based on the rationale discussed further below. This exposure frequency represents potential future hypothetical use assuming the area is used frequently by recreational users. This scenario will satisfy "The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors)." Therefore, this scenario evaluates a future use of the Coke Point Area in compliance with RCRA.

It is important to note that the exposure parameters used in the previous draft and planned for use in the source characterization/corrective action assessment are precautious but are still considered relevant and defensible. The exposure parameters used in the HHRA for each receptor are based upon reasonable maximum exposures that have the potential to occur in the area. The number of days for the watermen takes into account the length of the crabbing season and the fact that a watermen would not stay in one area for an entire work week. The use of 8 hours corresponds to a typical work day used in typical RCRA HHRAs. The assumption is not that watermen would have their hands immersed in the Patapsco River but would have contact with surface water constantly during a typical work day through immersion, pulling in of catch, and handling other equipment that would account for an 8 hour exposure.

The assumption of every weekend for the entire summer took into account a variety of potential exposures. First, the Coke Point Offshore Area is located in proximity to a number of public boat launches that make access to the area quickly and easily accessible. Second, the definition and use discussion set forth

by MDE in the cleanup Standards for Soil and Groundwater were taken into account. While this definition is specifically set forth for contact with soil, the number of days per year for contact was evaluated. The minimum frequency of visits noted in these standards is 52 days/year, which assumes a "low frequency use". The offshore area is not restricted for use by boaters who visit the area but is most likely a low frequency use area. Because specific studies are not available to determine the exact number of days per year the area is used, the HHRA assumed a conservative, but reasonable number of visits accordance with RAGS A.

The HHRA will also be revised to include a discussion of PAH detections, the spatial distribution of the detections, the conservative nature of the USEPA dermal model for exposure to PAHs, and the potential over-estimate of risk. Further emphasis on the fact that the risks presented for the surface water pathway represent potential, not actual, risks due to the use of the U.S. EPA dermal exposure model.

Comment 3: It is stated in Section 5.2.2 that "Due to the limited sample size for the Patapsco River dataset, a 95% UCLM could not be determined." It is stated further that using the median for the Patapsco River Background Area surface water and sediment exposure point concentration (EPCs) "… better represents a central tendency exposure or typical exposure expected in the Patapsco River that does not overestimate risks in comparison to the Coke Point Offshore Areas." This is a flawed and biased approach for the following reasons: (1) comparing risk estimates based on the Background Area median EPCs to risk estimates based on the Coke Point Area 95% UCL EPCs is an apple to oranges comparison, essentially comparing central tendency to upper estimate, resulting in a low bias to the Patapsco River Background Area and a high bias to the coke Point Area; (2) all of the field data for crab and fish filet was limited to five samples per area, yet 95% UCLs were calculated for all of this data and used in the risk estimates even though this number is less than the Patapsco River dataset for either surface water or sediment. This is highly inconsistent.

Response: *The primary purpose and objective of the risk assessment is to evaluate potential risks for exposure to the Coke Point Offshore Area using a reasonable maximum exposure which takes into account the 95% confidence level of the mean. The background area is not the primary focus of the assessment and is only presented to provide a context for risks at the Coke Point area.*

The median concentration was used to represent concentrations in background because this was considered the best representation of the exposure point concentration for the background data set. Use of the median avoids several

factors that potentially skew interpretation of the background data, including the small sample size and the fact that chemicals were often detected at or below the reporting limits. This is in large part due to the fact that chemicals were detected less frequently and at much lower levels in background than at Coke Point.

To address concerns by U.S. EPA and MDE, additional data from sampling of Baltimore Harbor approach channels within the Patapsco River will be sought. Data will be analyzed as part of the Sensitivity Analysis presented in Appendix G to help evaluate the relevance of the background surface water data. Based on evaluation of these data, a determination will be made as to the relevance of median versus 95% UCLM as EPCs. Should the data indicate that median values underestimate background exposures, risks for the Patapsco River Background Area will be estimated using a 95%UCLM (assuming a reporting limit for non-detects) or, where the 95%UCLM cannot be calculated, a maximum detected concentration. The use of the median concentration to estimate Patapsco River Background risks will be included in the Sensitivity Analysis, Appendix G. It is noted that the use of the median concentration for the Patapsco River Background area and the 95% upper confidence level mean for Coke Point is a valid comparison of mean concentrations. Due to limitations in the background dataset, a 95% UCLM cannot be calculated for most of the chemicals detected in sediment and surface water within the background area. Therefore, risks for the Patapsco River Background area will be estimated based upon a maximum detected concentration. This will actually result in a comparison between a 95% upper confidence level on the mean for Coke Point Offshore Area and an upper level estimate for the Patapsco River Background Area.

Comment 4: The risk characterization for aquatic and benthic organisms (Section 4.1.8) does not include a second comparison, or refinement, commonly used in ecological risk assessments. The sediment chemical concentrations were only compared to sediment threshold toxicity reference values (TRVs). This only provides an indication of the potential for toxicity to benthic organisms. It is common practice to then compare the sediment concentrations to probable effect TRVs, which are upper-bound reference values that provide more certainty regarding the likelihood of adverse effects to benthic organisms. Therefore, this risk characterization is incomplete.

Response: *Comparisons to probable effect TRVs (e.g. PELs and ERMs) have been added to the assessment to provide a more complete characterization of risks to aquatic and benthic organisms. Threshold TRVs are considered to provide a more protective indicator of the potential for risks. However, it is acknowledged that*

use of such TRVs may be precautionary, and that exceedence of probable effects TRVs are a more definite indicator of the potential for risks. It should be noted that the majority of the chemicals identified as primary risk drivers for aquatic and benthic organisms exceed both threshold and probable effects TRVs.

Comment 5: The risk characterization for wildlife in the Coke Point Offshore Area is highly flawed. Both the osprey and the river otter receptors were treated as if the Turning Basin and Coke Point Offshore Area constituted their entire home range. The osprey has foraging radius of 3 – 8 kilometers, and the river otter home range is in the hundreds of thousands of hectares. Thus, the risk estimates for these receptors in this ecological risk assessment are highly inflated and should be considered by the Agencies as unreliable. Secondly, a river otter is a poor choice for the Coke Point Offshore Area, since this species could not possibly inhabit the area. The more realistic receptor that should have been used is the raccoon, although it is highly questionable whether the Coke Point Area could even support this species. Additional sources of exposure over-estimation include surface water ingestion for both receptors, which is impossible since surface water is brackish, and risk estimates for osprey based on ingestion of benthic organisms and crab, neither of which is possible. Osprey only consume fish. Finally, the Executive Summary did not present the LOAEL-based hazard quotients, which are always an important component of ecological risk characterization and typically carry more weight in risk reduction decisions.

Response: *While the home range of otter and osprey are large, these species represent other species that have smaller possible home ranges. These include heron, waterfowl, and raccoon. For this reason, home range is employed cautiously as part of a discussion of the range of species that may utilize the site. This is consistent with the risk assessment methods requested by the U.S. EPA for other sites on the Chesapeake Bay. The risk assessment has been revised to include a description of various species that may utilize the site and their respective home ranges. The public health/ecological impact assessment within the revised report will include tables presenting NOAEL – and LOAEL-based HQs adjusted using AUFs. Adjustments will assume that wildlife receive a portion of exposure from the Coke Point Offshore Area and the remainder of exposure from the Patapsco River Background Area.*

River otter was originally chosen as representative receptor for mammals which consume fish because it may inhabit Baltimore Harbor and can feed in deeper water beyond the shoreline. It is acknowledged that the Coke Point shoreline does not provide ideal habitat for river otter; however, past impacts to the

shoreline are part of the reason it provides poor habitat. Raccoon was previously not selected as a representative receptor because raccoons are unlikely to feed in deeper water and would receive all of their exposures along the shoreline where concentrations of many chemicals are highest. Also, raccoons would receive part of their diet from upland areas of Coke Point that may contain chemicals but which are beyond the scope of this risk assessment. While osprey eat primarily fish, it must be noted that osprey were selected to represent a variety of birds that may consume crustaceans and benthos.

Based on these comments regarding osprey and otter, the risk assessment has been expanded to include two additional ecological receptors: raccoon and great blue heron. These receptors would consume fish, crabs, and benthos. Inclusion of additional receptors is expected to provide more information to support decision-making based on the risk assessments, as the representativeness of each species can be weighed against uncertainty.

It is acknowledged that wildlife are unlikely to consume brackish water intentionally; however, wildlife are likely to consume some water while swimming (for mammals) or grooming and feeding (birds and mammals). Surface water ingestion rates are based on U.S. EPA guidance (USEPA 1993), which provides rates based on estimated metabolic requirements for consumption of water. No rates are available for incidental ingestion of water; therefore, available values are used unchanged as a precaution. Overall, surface water ingestion rates are high but not inconceivable for incidental ingestion during swimming or foraging. The ingestion rates used in the assessment equate to ingestion of 77 mL and 107 mL per day (1/3 to 1/5 cup) of water per day for osprey and heron, and 564 mL and 599 mL per day (2.4 to 2.5 cups) of water per day for raccoon and otter. It should be noted that consumption of surface water contributes a very small percentage of the total risk to wildlife, and removing water ingestion from food web models does not alter the overall results. Additional discussion of uncertainties associated with surface water have been added to the assessment.

Additional discussion of LOAELs has been added to the executive summary and conclusions. Exceedence of NOAELs is the primary focus of risk assessment, and LOAELs are considered in interpreting results to be carried forward into risk management.

Comment 6. Section 5.7.4, Dermal Exposure Values. It is stated in this section that the sediment chemicals without U.S. EPA-recommended dermal absorption fraction values were not quantitatively evaluated. However, U.S. EPA Region III dermal guidance recommends a 1% default for these chemicals (inorganics), which should have been employed in the quantitative risk assessment.

Response: *The dermal exposure values used in the sediment exposure pathway were completed to be consistent with U.S. EPA RAGS E guidance. The calculations presented are also consistent with the procedures the U.S. EPA uses to calculate the Regional Screening Levels. The HHRA will be revised to include potential dermal absorption for both inorganics and volatile organic compounds as noted in the USEPA Region 3 dermal guidance.*

Comment 7. Section 5.6, Risk Characterization Results, Scenario 2. All of the intake values for crab and fish ingestion pathway, for all receptors (Coke Point and Patapsco River Background), appear to be incorrectly low, using the exposure parameters and equations in Tables 5.2.4.9-5.2.4.12. However, this under-calculation of intake is somewhat counteracted by what is probably an artificially high contribution to risk by the purely estimated dioxin TEQ exposure point concentrations. The crab and fish tissue samples were not analyzed for dioxins; the exposure point concentration was calculated from a generic bioaccumulation factor.

Response*:* *Intake values for crab and fish ingestion were thoroughly reviewed and found correct. Tables 5.2.4.9-5.2.4.12 will be reviewed and revised to ensure that all reviewers will be able to duplicate intake values included in the HHRA. Additionally, sample calculations for the HHRA are provided in Appendix F. The HHRA text will be revised to note where dioxin are identified as primary risk drivers that these results are based upon the BAF calculations.*

Comment 8a. Appendix H, Laboratory Bioaccumulation and Field-Collected Tissue Study. Section 4.1.1.3, Bioaccumulation Statistical Comparisons. This section states that all statistical comparisons used the Student t-test. However, this test is dependent on normal distributions of the data sets. The U.S. EPA *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates (1994)* states that parametric tests are only appropriate if a normal distribution has been demonstrated for the data sets in question. Simply using the Student t-test without demonstrating normality can cause erroneous test results. Therefore, the conclusions of this section may be in error.

Response*:* *Bioaccumulation exposures were conducted in accordance with U.S. EPA guidance (EPA 1993) for testing sediments to determine bioaccumulation in estuarine and marine organisms (rather than freshwater organisms). This guidance identifies the Student t-test as the standard test for statistical comparisons when there is no indication that data are not normally distributed. Therefore the Student t-test was utilized. However, the relevance of the comment is acknowledged, and non-parametric tests have been used for comparisons and results modified accordingly. Non-parametric tests performed according to U.S.*

EPA guidance are used for all comparisons because the samples size and number of detections preclude characterization of the statistical distribution.

Comment 8b. This section lists nickel as significantly higher in the Coke Point clam tissue compared to the Background clam tissue. However, according to Table 11, nickel is not statistically greater, it is actually selenium instead. This should be corrected.

***Response**:* *The error has been corrected, and results revised per Comment 8a.*

Comment 8c. This section lists aluminum, iron, lead, manganese, nickel, and silver as significantly higher in the Coke Point worm tissue compared to the Background worm tissue. However, Table 14 shows that all of these inorganics showed no significant difference between the Coke Point pre-test worm tissue and post-test worm tissue. This indicates these inorganics cannot be said to be a result of exposure to Coke Point sediment. This should be corrected in order not to exaggerate Coke Point-associated risks.

***Response**:* *The listing of chemicals significantly higher in the Coke Point worm than in background tissue has been modified to highlight those chemicals that were statistically significantly higher in post-test tissue compared to pre-test tissue.*

Comments received from MDE Land Restoration Program, 7 April 2011

Comment 1: Medium-Specific Exposure Point Concentration Summary Tables, Please confirm that all medium EPC values for surface water and sediment in the Coke Point Offshore Area were derived using both detected and nondetected analytical results. The tables and text are not clear as to whether the nondetected values were utilized in deriving the EPCs and Appendix B contains the statistical results but does not include the data utilized in the calculations.

Response: *The medium EPC values for the Coke Point Offshore Area take into account both detected and nondetected analytical results. The statistical results presented in Appendix B note that only the detected results are used to determine the appropriate data distribution. However, the calculation of the 95%UCLM takes into account both detected and nondetected analytical results. This is shown on the statistical outputs presented in Appendix B. For all chemicals, the ProUCL output identifies number of non-detect data, percent non-detects, minimum non-detect, and maximum non-detect. This reveals that the inputs into the ProUCL program do contain nondetected analytical values. The risk assessment text, Section 3, will be revised to explicitly state that both detected and nondetected analytical results are included in the 95%UCLM calculation. In addition, the full dataset used to perform the risk assessment will be provided in an appendix.*

Comment 2: The use of the median concentration as the EPC for the background sediment and surface water data sets is not acceptable when the reporting limit has been substituted for the detection limit for nondetected analytes. Example, the EPC for benzo(a)pyrene in surface water was 0.011 ug/L which is approximately 20 times lower than the detection limit for all nondetected samples. This results in a significant underestimation of risk in the Patapsco River Background Area. If no additional background data will be collected use the maximum detected background concentration data to calculate risk in the Background Area and provide a discussion of risks associated with PAHs at or near the detection limit of samples collected for this study.

Response: *The primary purpose and objective of the risk assessment is to evaluate potential risks for exposure to the Coke Point Offshore Area. The background area is not the focus of the assessment and is only presented to provide a context for risks at the Coke Point area.*

The median concentration was used to represent concentrations in background because this was considered the best representation of the central tendency of the background data set. Use of the median avoids several factors that potentially skew interpretation of the background data, including the small sample size and the fact that chemicals were often detected at or below the reporting limits. This is in large part due to the fact that chemicals were detected less frequently and at much lower levels in background than at Coke Point.

Also, additional data from sampling of Baltimore Harbor approach channels within the Patapsco River will be sought. Data will be analyzed as part of the Sensitivity Analysis presented in Appendix G to help evaluate the relevance of the background surface water data. Based on evaluation of these data, a determination will be made as to the relevance of median versus 95% UCLM as EPCs. Should the data indicate that median values underestimate background exposures, risks for the Patapsco River Background Area will be estimated using a 95%UCLM (assuming a reporting limit for non-detects) or, where the 95%UCLM cannot be calculated, a maximum detected concentration. The use of the median concentration to estimate Patapsco River Background risks will be included in the Sensitivity Analysis, Appendix G.

Comment 3: The evaluation focused on the sediment and surface water in the area of the Proposed Coke Point Dredged Material Containment Facility. Please provide a qualitative discussion of the potential groundwater and runoff discharges that are sources contributing to these risks. The presentation provided by the MPA briefly touched upon these sources and to ensure they are adequately addressed during the remedial design phase please provide a further discussion of these source

inputs. Additionally, please include a discussion of the surface water exposure pathway, which represented dominant exposure pathway, in the risk reduction section of the Conclusions.

Response: *The requested information will be included within the risk assessment. In addition, maps and text detailing the spatial distribution of detects within surface water will be included in the risk assessment.*

Comments received from MDE Water Program, 7 April 2011

Comment 1: Risks were calculated for a rather small exposure area which will lead to a potential overestimation of human health risks.

Response: *It is agreed that the Coke Point Offshore and the Patapsco River Background areas are relatively small in comparison to the entire Patapsco River. However, the risk assessment was undertaken to determine potential risk contribution from the Coke Point Offshore Area within the context of due diligence investigation and MPA's planning requirements. The risk assessment also takes into account potential exposures across the entire 500 acres, which includes both detected and nondetected analytical results. As a result, the risks are averaged across the area and do not necessarily result in a large overestimation of risks based upon the exposure area only.*

Comment 2: Risks from the ingestion of crabs and ingestion of fish are in excess of MDE recommended levels, however, the results from the Coke Point Offshore area are similar to the Patapsco River background area. Fish and shellfish advisories are in effect throughout the Patapsco and estimated risks within the report are lifetime and do not represent acute hazards.

Response: *The risks from ingestion of crabs and fish are comparable between the Coke Point Offshore area and the Patapsco River background. However, the chemicals that contribute these risks differ based upon the area evaluated. PAHs are the primary chemical within the Coke Point Offshore area and total PCBs for the Patapsco River Background area.*

Comment 3: Sediment exposures for recreational users within the Coke Point Offshore area are generally within acceptable limits using conservative assumptions.

Response: *It is agreed that risks for direct contact with sediment are within acceptable limits.*

Comment 4: Exposure to surface waters in the Coke Point Offshore area (dermal contact surface water, specifically PAHs) represents the greatest contributor to potential risks in the Coke Point area. This exposure route contributes roughly 90% of all

the risks at the site. The risks associated with dermal contact with PAHs in the water column (0.8 ug/L Benzo(a)pyrene) is an extremely difficult endpoint to calculate and has a very high degree of uncertainty. Because of this high degree of uncertainty, risks associated with surface water dermal contact PAH exposures typically do not represent the exposure route that would drive an environmental response at a site.

Response: *Dermal contact with surface water does contribute significantly to calculated cumulative risks results for the Coke Point Offshore area. However, this is not the only exposure pathway to contribute risks above the acceptable risk range. The U.S. EPA model used to estimate potential risks from dermal contact with surface water contains uncertainties that are discussed within the risk assessment. The risk assessment text will be revised to discuss these uncertainties in more detail within the risk assessment conclusions. Additionally, maps and text that present the spatial distribution of surface water detects will be included in the risk assessment to further put the risks into context in comparison to overall exposure to the Coke Point Offshore area. The surface water exposure pathway will also include a discussion of the groundwater to surface water transport pathway that provides a continual discharge and therefore, should also be considered for a corrective measure in context with potential surface water risks to humans.*

Comment 5: There were a very limited number of sediment and water samples (6 and 9, respectively) used to determine Patapsco River background as well as used to model human health and ecological risks. This is in comparison to 37 sediment and 96 water samples used to characterize Coke Point. As a result, the background condition is likely inadequately characterized. Also, did you provide information in the risk assessment as to how the background locations were determined?

Response: *The risk assessment will be revised to detail how the background locations were selected. The purpose and objective of the risk assessment is to characterize potential risks associated with exposure to the Coke Point Offshore area. Potential risks associated with the Patapsco River background area are only presented to put the Coke Point area risks into context. The risk assessment was not performed to characterize the entire Patapsco River area, which is beyond what is typically considered "background" in a RCRA risk assessment. RCRA risk assessment methodology does not required quantification of background risk.*

As discussed above in response to other comments, additional data from sampling of Baltimore Harbor approach channels within the Patapsco River will be sought. Data will be analyzed as part of the Sensitivity Analysis presented in Appendix G to help evaluate the relevance of the background surface water data. Based on

evaluation of these data, a determination will be made as to the relevance of median versus 95% UCLM as EPCs. Should the data indicate that median values underestimate background exposures, risks for the Patapsco River Background Area will be estimated using a 95%UCLM (assuming a reporting limit for non-detects) or, where the 95%UCLM cannot be calculated, a maximum detected concentration. The use of the median concentration to estimate Patapsco River Background risks will be included in the Sensitivity Analysis, Appendix G.

Comment 6: Appendix H: Bioaccumulation Study. It does not appear that sediment grain size was taken into consideration during the toxicity tests. Fine grained sediments (clays and silts) naturally contain higher level of contaminants due to their smaller surface area and slight electrical charge. So bioaccumulation studies that do not control for grain size may show greater bioaccumulation simply as a result of differences in the grain size of exposure sediments. Was any attempt made to control for grain size in the exposure sediments (both Coke Point and Patapsco River background)? Please explain.

Response: *Bioaccumulation tests eliminate the need to incorporate grain size into prey tissue uptake models by providing tissue data from actual exposures to the sediment. Bioaccumulation tests use sediment from the project site. Therefore, they automatically include the influence of grain size.*

Comment 7: Appendix H: Bioaccumulation Study. Were total organic carbon (TOC) and acid volatile sulfide (AVS) levels determined in exposure sediments? Concentration of TOC and AVS in sediments affect contaminant bioavailability. If so, please explain how this factored into your analysis of bioaccumulation results.

Response: *Bioaccumulation tests eliminate the need to control for TOC and AVS into prey tissue uptake models by providing tissue data from actual exposures to the project site sediment. The bioaccumulation tests used sediment from the site. Therefore, they automatically include the influence of TOC and AVS.*

Comment 8: Appendix H: Bioaccumulation Study. Half the detection limit was used in reporting non-detects, which is a standard practice. However, many of the reported results for the Coke Point samples were close to the detection limit. In such cases it is often recommended that a statistical analysis is performed to determine whether using half the detection limits skews results. Was a analysis done using the full detection limit to determine if this resulted in a statistically smaller differences between Coke Point and Background samples? Please explan.

Response: *As noted in the Response to U.S. EPA comment 8a, statistical comparisons are revised in Appendix H. Non-parametric statistics are utilized in place of Student's T-tests and results revised accordingly; these tests make use of the full*

reporting limit to represent non-detected samples. Non-parametric tests eliminate much of the influence of reporting limits because data are ranked.

COMMENTS ON THE
AGENCY REVIEW DRAFT OF THE
"FINAL RISK ASSESSMENT OF OFFSHORE AREAS ADJACENT TO THE PROPOSED COKE POINT DREDGED MATERIAL CONTAINMENT FACILITY AT SPARROWS POINT,
BALTIMORE, MARYLAND

Comment #	Page	Line	Section	Comment	Response:
Commenter name, agency, date: Ruth Prince, Land and Chemicals Division, EPA Region III, May 19, 2011					
1	ES-13	21-27	Executive Summary, HHRA	These four sentences state that future unrestricted use or potential beneficial future use are requirements of RCRA. These statements are errors, particularly "Therefore, this scenario evaluates a potential beneficial use of the Coke Point Area in compliance with RCRA." Please refer to OSWER Directive 9355.7-04 *Land Use in the CERCLA Remedy Selection Process*, equally applicable to RCRA. Both CERCLA and RCRA base future land use assumptions on "reasonably anticipated future land use," based on current and expected zoning and land use patterns. RCRA expects continued industrial/commercial use for Coke Point at this time. The OSWER Directive states: "Consideration of non-residential uses is especially likely to be appropriate for RCRA facility cleanups." The HHRA-SC is not a scenario that RCRA Corrective Action would use or evaluate. The HHRA-SC employs the unreal scenario of recreational users swimming off of Coke Point and the Turning Basin every summer weekend, as well as treating migratory crabs and fish for human consumption as sedentary species that are exposed to the Coke Point sediment and surface water contamination continuously.	Any references to RCRA or requirements of RCRA will be removed from the HHRA text. The HHRA will indicate that the risk assessment is undertaken to aid the MPA with internal decision making for future site planning.
2	ES-14	17-18	Executive Summary, HHRA	"Cumulative risk results are above the USEPA carcinogenic and non-carcinogenic target levels." –This sentence exaggerates the non-cancer risk – only the child recreational user exceeds target non-cancer risk. This statement is not factual.	Based on EPA's clarification that the target threshold HI for noncarcinogenic risk is 1.5, the sentence will be revised to state: "Cumulative carcinogenic risk results are above the USEPA carcinogenic target levels for all receptors, except the child recreational user. Non-carcinogenic hazards exceed USEPA target levels for only the child recreational user."

Comment #	Page	Line	Section	Comment	Response:
3	ES-15	11-12	Executive Summary, HHRA	"Thus, this exposure scenario provides the best indication of the potential contribution of Coke Point sediments to exposures and risks for the Coke Point Offshore Area only." – This statement is in error. It is not a "best indication" because it is a biologically implausible scenario – migratory fish and crab cannot be treated as sedentary species that obtain lifetime exposure from the Coke Point sediments and surface water only. This scenario instead could be termed "theoretical worst-case," since it essentially creates purely theoretical sedentary species for humans to consume.	Any discussion for the HHRA for Source Characterization and Site Planning (HHRA-SC) will be revised to indicate that the risk assessment is undertaken to aid the MPA with internal decision making for future site planning. The sentence quoted will be changed to: "Thus, the HHRA-SC provides a theoretical maximum exposure that provides conservative indication of potential contribution from offshore sediment and surface water."
4	85 and ES-2, line 2-3	4-6	5, HHRA for Public Health Impacts	"The HHRA-PH evaluates actual exposures people in the area near the Coke Point Peninsula would experience given the most likely current site use. This HHRA identifies any potential immediate Public Health impacts." – These are not factual statements. "Actual exposures" indicates that EA has documented the human exposures in the Coke Point study area used in this HHRA – that is, swimming at Coke Point and a high frequency of fishing and crabbing at Coke Point, which is not true. This is not a case of estimating risk to actual on-site workers or residents, it is an off-site theoretical risk assessment which has no relationship to "current site use". Due to the theoretical scenarios employed, the HHRA-PH does not identify "potential immediate Public Health impacts" either. In addition, "immediate" implies acute effects, when the risk assessment only addresses chronic exposure and effects.	The sentence will be revised to state: "The HHRA-PH evaluates potential exposure people would experience under the current conditions of the Coke Point offshore area. The HHRA-PH evaluates the Coke Point Offshore Area for an expected low frequency of use as a recreational area."

Comment #	Page	Line	Section	Comment	Response:
5	109	28-29	5.5.1.1	1.2 is not greater than the target threshold of 1. The target threshold was not exceeded.	The HHRA text will be revised to cite the threshold provided by EPA of 1.5. The HHRA text that discusses the risk characterization results for all receptors will be revised to remove any statements that detail whether risk results are greater than or below the target threshold of 1.5. Instead, only the risk results will be presented. For instance, Section 5.5.1.1 will be revised to state, "The total calculated non-carcinogenic HI for the adult recreational user is 1.2. The ingestion of crab pathway is the primary contributor to this risk result."
6	111	6-7	5.5.2.1	1.4 is not greater than the target threshold of 1. The target threshold was not exceeded.	Please see response for Comment #5.
7	114	27-28	5.5.4.2	1.34 is not greater than the target threshold of 1. The target threshold was not exceeded.	Please see response for Comment #5.
8	123-124	35-37	5.7, HHRA-PH Summary	"The HHRA-PH provides characterization of the people fishing/crabbing in the area and is indicative of overall, potential public health concerns. This exposure scenario characterizes human exposures given the most likely current site use as an active RCRA facility." – The first sentence indicates that EA has documented people fishing/crabbing in the Coke Point study area at the frequencies used in the HHRA. This is not true, so this is not a factual statement. It is a theoretical scenario only. Secondly, this offshore use has essentially no relationship to Coke Point as an active RCRA facility, and it is not a "current site use."	The sentence will be revised to remove any reference to the current site use of the Coke Point Peninsula. The following statement will be inserted into the text: "The HHRA-PH evaluates potential exposure people would experience under the current conditions given a site specific scenario of the Coke Point offshore area. The HHRA-PH evaluates the Coke Point Offshore Area for an expected low frequency of use as a recreational area.
8	124	5-6	5.7, HHRA-PH Summary	"This HHRA evaluates human exposures as a result of typical movement of aquatic organisms and people and uses of the Patapsco River." – This indicates that EA has documentation of human activity and use in the area, which is not true, so again this is not a factual statement.	The sentence will be revised to state, "The HHRA-PH provides an estimate of a site-specific exposure that takes into account mobility of aquatic organisms in the offshore area."
9	124	7-8	5.7, HHRA-PH Summary	"… considered to be reflective of current site conditions as an active RCRA facility . . " The offshore assessment has no relationship to on-site conditions, and the assessment in no way reflects current on-site conditions.	Any reference to the current site conditions or a RCRA facility will be removed from the text.

Comment #	Page	Line	Section	Comment	Response:
10	126	8-9	5.7, HHRA-PH Summary	Non-cancer risks are not above the target hazard quotient except for the child recreational user.	The following statement will be inserted into the text: "Non-carcinogenic hazards exceed USEPA target levels for only the child recreational user."
11	129	4-6	6, HHRA-SC	"Section 5 evaluates the offshore area based upon the current conditions of the Coke Point Peninsula as an active RCRA facility . . ." – The current on-site conditions have no relationship or relevance to the theoretical off-shore scenario employed in this risk assessment.	Any reference to the current site conditions or a RCRA facility will be removed from the text.
12	129	6-7	6, HHRA-SC	"This section presents the HHRA-SC, and it provides an evaluation of human health risks that will aid in determining potential remediation requirements." - This is not a factual statement. EPA will not use this risk assessment for corrective action purposes, or any other purpose, as it employs the unreal scenario of recreational users swimming off of Coke Point and the Turning Basin every summer weekend, as well as treating migratory crabs and fish for human consumption as sedentary species that are exposed to the Coke Point sediment and surface water contamination continuously.	The text will be revised to state, "This section presents the HHRA-SC, and it provides a conservative evaluation of human health risks that will aid the MPA with internal decision making for future site planning."
13	129	10-15	6, HHRA-SC	All sentences here referencing support of or compliance with RCRA are not factual statements and RCRA will not use this risk assessment.	Any reference to the current site conditions or a RCRA facility will be removed from the text.
14	129	19-20	6, HHRA-SC	"Therefore, the HHRA-SC primarily evaluates modeled exposures that are considered reasonable maximum exposures." – These cannot be considered RMEs because the species for which contaminant uptake is modeled are highly migratory and could never be continuously exposed to site contaminants. This statement is not factual.	The referenced sentence will be removed from the text.
15	133	28-29	6.1.1.1	Error: the sentence states dioxins, SVOCs, and VOCs were not modeled in crab tissue, when they in fact were.	The word "not" will be removed from the text.

Comment #	Page	Line	Section	Comment	Response:
16	135	8-13	6.2	All sentences here referencing support of or compliance with RCRA are not factual statements and RCRA will not use this risk assessment.	Any reference to compliance with RCRA will be removed from the text.
17	159	19-24	6.7	All sentences here referencing support of or compliance with RCRA are not factual statements and RCRA will not use this risk assessment.	Any reference to compliance with RCRA will be removed from the text.
18	171	12-14	7.3	"This HHRA provides a more accurate risk characterization of the people fishing/crabbing in the area and is more indicative of overall public health concerns." – This statement indicates that EA has documented the fishing/crabbing activity in the Coke Point study area, which is not true.	The sentence will be revised to state, "The HHRA-PH provides an estimate of a site-specific exposure that takes into account mobility of aquatic organisms in the offshore area. The HHRA-PH evaluates potential exposure people would experience under the current conditions of the Coke Point offshore area. The HHRA-PH evaluates the Coke Point Offshore Area for an expected low frequency of use as a recreational area.
19	171	15-21	7.3	All sentences here referencing support of or compliance with RCRA are not factual statements and RCRA will not use this risk assessment.	Any reference to compliance with RCRA will be removed from the text.