N00174.AR.000429
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Final

Remedial Investigation Report for the Lab Area (Sites 15, 16, 49, 50, 53, 54, and 55)

Naval District Washington, Indian Head
Indian Head, Maryland

Contract Task Order 66
January 2004

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the

LANTDIV CLEAN II Program
Contract N62470-95-D-6007

Prepared by

CH2MHILL

Herndon, Virginia

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Executive Summary

This report describes the work performed for, and the results of, the remedial investigation (RI) conducted at the Lab Area (Sites 15, 16, 49, 50, 53, 54, and 55) at Naval District Washington, Indian Head (NDWIH), in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy, as Contract Task Order (CTO) 0066 under U.S. Navy Contract N62470-95-D-6007.

The objectives of the RI were presented in the work plan [Brown & Root Environmental (B&RE), 1997] and the site-specific work plan (CH2M HILL, 2001) as:

- Characterize the nature, extent, and concentrations of site-related contaminants in surface soil, subsurface soil, manhole and wetland sediments, and surface water, and determine the rate of migration of site-related contaminants in the environment;
- Remove the Chemical Disposal Pit at Site 49; and
- Identify actual or potential human or environmental receptors and potential contaminant migration pathways.

Field work for the Lab Area RI began on April 30, 2001, and concluded on May 25, 2001. The field investigation included surface soil sampling, subsurface pipe bedding soil sampling, sewer sediment sampling, wetlands surface water and sediment sampling, removing the Chemical Disposal Pit, and obtaining location coordinates with a global positioning system (GPS) unit. Disposal of the Chemical Disposal Pit rubble investigation-derived waste (IDW) occurred on August 10, 2001. Disposal of other IDW from the Lab Area RI field investigation [i.e., soil, decontamination fluids, and personal protective equipment (PPE)] occurred on August 21, 2001.

In most instances, where analytical samples were collected, a full suite of analyses was performed. The full suite was comprised of Target Compound List (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), Target Analyte List (TAL) inorganics (i.e., metals and cyanide), and explosives [which also included nitroglycerin (NG), nitroguanadine (NQ), pentaerythritol tetranitrate (PETN), and perchlorate, in addition to the list of analytes included in United States Environmental Protection Agency (USEPA) SW-846 Method 8330].

Various chemicals were detected throughout the Lab Area, the more prominent being nitrocellulose (NC), arsenic, lead, and mercury, among other inorganics and SVOCs. NC was not determined to be a risk, and was not observed to occur in a particular spatial pattern, other than occurring at higher concentrations in the surface soil at the topographic low sides of Buildings 102, 103, 108A, and 502.

With metals in surface soil, the highest concentrations and the largest number of detections generally were encountered in samples collected around Buildings 102 and 103, and around other buildings in the eastern part of the Lab Area. This is likely due to lead-based paint found on these buildings, as well as the storage and laboratory practices in these buildings

in this of the site. Samples collected along the northwestern and northern portions of the site had among the lowest concentrations of metals, likely due to higher topography and lower laboratory density.

Arsenic, lead, and mercury were prominent throughout the Lab Area in the subsurface soil. Hot spots were identified around Manholes "A" and 471. Likely transport mechanisms for these constituents include releases from leaking underground sewer pipes and/or manholes, as well as infiltration and leaching from surface spills to about 4 feet below ground surface (ft-bgs).

Overall, every sewer sediment sample demonstrated elevated levels of mercury, with some correlation to subsurface soil samples associated with the manholes, suggesting that mercury contamination in the subsurface soil occurred as a result of deteriorated piping and manhole connections. Mercury contamination was expected in the Lab Area due to the various laboratory activities involving mercury, and elevated levels above base-wide background are assumed to be entirely site-related.

The emergent wetlands contained elevated levels of mercury, arsenic, lead, and some organics. The soil, sediment, and surface water analytical results were reviewed and used for screening against human-health and ecological screening criteria.

The Chemical Disposal Pit was removed, and confirmatory surface soil samples just outside the perimeter of the excavation, as well as the subsurface soil sample just below the excavation demonstrated no risk outside of USEPA's acceptable risk ranges to human or ecological receptors. Although this RI did not include Site 14, the Old Waste Acid Pit (OWAP), the abandoned OWAP was seemingly discovered underneath the Chemical Disposal Pit during the excavation activity. Due to the co-location of these pits, data collected associated with the Chemical Disposal Pit were also considered representative of the OWAP, and results of this RI were considered sufficient to also document closure of the OWAP.

The shallow geology of the site consists of fine- to medium-grained silty sand to a depth of approximately 4 ft-bgs. At this depth, a dense clay layer was encountered during the direct push technology (DPT) activity. The lower limit of this clay layer was not encountered in borings advanced to depths of up to 16 ft-bgs during this RI. Previous investigations detailed that the clay layer extends from 4 to 40 ft-bgs (E/A&H, 1994), where a sandstone marker bed was encountered during the 1992 SI (E/A&H, 1994). Shallow groundwater has not been encountered at the site, and therefore, was not identified as a pathway for transport or exposure.

Based on the chemical and physical data gathered for the site, and information provided by NDWIH, the following potential contaminant source areas have been identified or may exist at the site:

- Disposal in the former Chemical Disposal Pit of solutions of metals, organic solvents, and possibly other chemicals;
- Surface and subsurface soil contaminated by historic site operations disposal practices (e.g., physical dumping);
- Sewer sediment contaminated by site operations; and

- Emergent wetlands sediment contaminated by site operations;

Possible contaminant transport mechanisms from the source areas at the site include the following:

- Precipitation causing erosion of surface soil from the site and deposition in emergent wetland sediments;
- Precipitation causing leaching of contaminants from the surface soil and transport by surface runoff to the emergent wetland;
- Precipitation causing leaching of contaminants from the surface soil to the subsurface soil;
- Leaching of contaminants from the sewer to the subsurface soil through cracks in the underground pipes and manholes;
- Leaching of contaminants from the sewer to the wetland sediment and surface water through cracks in the underground pipe (line from I568 Pipe Valve to Manhole 471A) and from surrounding contaminated subsurface soil, due to break in underground freshwater pipe(s) in vicinity; and
- Transport of contaminated surface soil (or contaminants in the surface soil) into the air by wind erosion (or volatilization), and subsequent deposition.

Through careful review of the data and the conditions at the site, it was determined that precipitation causing leaching of contaminants from the surface soil to the subsurface soil, overland flow transport of constituents, and the volatilization of constituents (i.e., mercury) are the primary mechanisms of transport at the site. Based on observations that portions of the emergent wetland have dried up since repairs of leaking underground pipes (beneath the emergent wetland) were performed, it is believed that the potential source and transport mechanism of contaminants leaking from the sewers to the wetland sediment and surface water is no longer present (although it may have contributed to past releases).

The human health risk assessment (HHRA) was conducted to evaluate the potential human health risks associated with the presence of site-related surface soil, subsurface soil, surface water, and sediment contamination at the Lab Area. Potential risks were calculated for a current/future industrial worker, current/future other worker, current/future adult trespasser/visitor, current/future adolescent trespasser/visitor, current/future adult other recreational person, current/future child other recreational person, future adult resident, future child resident, future lifetime resident, and future construction worker. The baseline risk assessment was conducted to characterize the potential current and future human health risks at the Lab Area if no additional remediation is implemented.

No VOCs, SVOCs, or explosive compounds were found to represent a potential risk outside of USEPA's acceptable risk ranges to human receptors, either due to concentrations being lower than criteria, the absence of an exposure point, and/or the absence of a pathway or route of exposure.

No carcinogenic risks were calculated outside USEPA's acceptable risk range. Surface soil, subsurface soil, and emergent wetlands sediment were the only media that had

noncarcinogenic hazards greater than the USEPA target levels. The main noncarcinogenic hazard risk drivers for these media were the following:

- **Subsurface Soil:** Mercury by incidental ingestion and inhalation to a future construction worker and hypothetical future adult or child resident;
- **Surface Soil:** Mercury by incidental ingestion and inhalation to a current/future industrial worker, future construction worker, and hypothetical future adult or child resident; and
- **Emergent Wetlands Sediment:** Arsenic by dermal contact to a hypothetical current/ future adult or child other recreation person.

Site-wide lead levels did not demonstrate a human health risk for lead; however, accounting for only the surface soil samples around Buildings 102, 103 and 304, lead was a potential health concern for hypothetical future small children residing near Buildings 102, 103 and 304, as well as current adult industrial workers (and their unborn fetuses) through incidental ingestion and inhalation of surface soil. All of the above noncarcinogenic risks were a result of the standard Reasonable Maximum Exposure evaluation in the HHRA; however, the subsequent Central Tendency (CT) analysis in the HHRA revealed no risks for any media.

The ecological risk assessment (ERA) for the Lab Area determined an ecological risk for direct exposure to copper, lead, mercury, zinc, and some organics in soil; aluminum, copper, cyanide, iron, lead, manganese, and mercury in emergent wetland surface water; and an ecological risk for direct exposure to arsenic, lead, manganese, mercury, and silver in emergent wetland sediment. Also, lead, mercury, and zinc all appeared to exhibit risk in the food chain for the American robin, white-footed mouse, and/or raccoon.

Inorganics in soil and sediment (particularly mercury) were of greatest concern at the site, posing potential risks to soil invertebrates, sediment invertebrates, and upper trophic level receptors that have substantial direct contact with soils or consume prey that have direct contact with soils. Food chain modeling also suggested that lead and zinc may pose risk through the food chain. Due to the high concentrations of mercury at the site, verification of the concentration of mercury in prey items is important for the top predators (e.g., red tailed hawk), even though food chain modeling showed minimal risk to this type of receptor.

Available data indicated that inorganic contamination, while generally highest near facility buildings upgradient of the emergent wetland, is distributed throughout much of the Lab Area. Wetland soil and stream channel samples collected downgradient of facility buildings suggest that inorganic contaminants have been transported into the emergent wetland, and potentially to Mattawoman Creek through the storm sewer system.

Although the distribution of organic contaminants of concern (COCs) was not clearly defined, available data suggested that their occurrence might be a result of small, isolated releases. Relative to the inorganic contamination at the site, organic COCs are not expected to contribute significantly to ecological risk at the site.

The emergent wetland is thought to be supported largely by potable water leaks (refer to Section 4.2.7). Two of these leaks were repaired since the RI field activities occurred, which

may potentially reduce the size of the emergent wetlands. Regardless of the size or the presence of the emergent wetlands, risk to ecological receptors cannot be ruled out.

During the preparation of this RI report, IHIRT and BTAG agreed on a path forward for the Lab Area (during the conference call on October 23, 2003). The decision included removing the impacted media in the emergent wetland and restoring the wetland using literature-based Preliminary Remediation Goals (PRGs) to be approved by BTAG. Removal and restoration will occur as part of the Feasibility Study (FS) and/or Engineering Estimate / Cost Analysis (EE/CA) effort for the Lab Area upland surface soil [to be investigated further through a baseline ERA (BERA)]. With the wetland restored, potential risks to wetland receptors (i.e., water column invertebrates, amphibians, and omnivorous wetland mammals) will be removed.

Further evaluation of potential ecological risk (i.e., a BERA) will be performed on the surrounding Lab Area surface soil, to (1) confirm with a greater level of certainty the risk posed by COCs, (2) more accurately define the spatial area over which those risks are present, and (3) support development of PRGs for possible subsequent soil removal if unacceptable risks are identified at the conclusion of the BERA.

Recommendations

All of the objectives established for the RI were met with this phase of work, except for entirely delineating the extent of ecological risk at the Lab Area. Therefore, additional RI sampling for additional definition of the nature and extent or human health risk assessment is not necessary.

Initial screening steps of the ecological risk assessment indicated that a more comprehensive ecological risk assessment would likely be necessary to more fully quantify the extent of ecological risk at the Lab Area. Therefore, IHIRT decided (during the time after distribution of the Draft Final RI Report) that the wetland area should be restored and a BERA should be performed for the upland soil portion of the Lab Area.

Restoration of the Wetland

IHIRT decided to remove the impacted media in the emergent wetland and restore the wetland to remove potential risks to wetland receptors (i.e., water column invertebrates, amphibians, and omnivorous wetland mammals). Therefore, a Technical Memorandum (to be approved by BTAG) will be prepared detailing literature-based PRGs for the contaminated wetland area soil/sediment, followed by an EE/CA for the wetland restoration.

BERA for Lab Area Surface Soil

IHIRT decided to continue with the remainder of the eight-step ERA process on the upland surface soil, because the SERA indicated there is a potential for site chemicals to pose a risk to ecological receptor populations. Therefore, a BERA Technical Memorandum and Work Plan will be developed to perform the BERA to (1) confirm with a greater level of certainty the risk posed by COCs, (2) more accurately define the spatial area over which those risks

are present, and (3) support development of PRGs for possible subsequent soil removal if unacceptable risks are identified at the conclusion of the BERA.

Focused FS and/or EE/CA

Since risk to human and ecological receptors remains at the site, a FS will be performed to evaluate remedial alternatives; however, the FS will proceed after the BERA for the upland soil in the Lab Area is completed. This will allow for selection of a remedial alternative that addresses both the human and [potential] ecological risks (pending the conclusion of the BERA for the upland soil). The RI indicates that risk to human health is driven by contamination in several "hot spots." Pending the conclusion of the BERA for the upland soil, there may also be defined hotspots that drive the ecological risk in the surface soil. Therefore, a Focused FS and/or EE/CA evaluating removal of these hot spots will be performed.

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Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ACM	asbestos containing materials
ATSDR	Agency for Toxic Substances and Disease Registry
B&RE	Brown and Root Environmental
BAF	Bioaccumulation factors
BCF	Bioconcentration factors
BIR	Background Investigative Report
BSIR	Background Soil Investigative Report
BTAG	Biological Technical Assistance Group
CEC	Cation Exchange Capacity
CH2M HILL	Cornell, Howland, Hayes, Merryfield, and Hill, Inc.
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Contaminant of Concern
COPC	chemical of potential concern
CRDL	contract required reporting limit
CS	Confirmation Study
CSF	cancer slope factor
CT	carbon tetrachloride
CTO	contract task order
DCA	1,2-dichloroethane
DCE	1,1-dichloroethene
DCP	1,2-dichloropropane
DL	detection limit
DNAPL	dense non-aqueous phase liquid
DPT	Direct Push Technology
DQO	data-quality objective
DSMA	di-sodium methyl arsenate
E&AH	Ensafe/Allen and Hoshall
EFACHES	Engineering Field Activity Chesapeake
ERA	Ecological Risk Assessment
ft-bgs	feet below ground surface
FS	Feasibility Study
GPS	Global Positioning System
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment

HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	hazard quotient
HRS	Hazardous Ranking System
HSDB	Hazardous Substance Database
HVAC	heating, ventilation, and air conditioning
IAS	Initial Assessment Study
ID	inner diameter
IDs	[sample] identification number
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IHIRT	Indian Head Installation Restoration Team
IR	Installation Restoration
IRIS	Integrated Risk Information System
Lab Area	Sites 15, 16, 49, 50, 53, 54, and 55
LMS	linearized multistage
LOAEL	lowest-observed-adverse-effect-level
MCL	maximum contaminant level
MDE	Maryland Department of the Environment
MDL	Maximum detection limit
MF	modifying factor
mg/kg	milligrams per kilogram
MSMA	Monosodium methyl arsenate
MS/MSD	matrix spike and matrix spike duplicate
msl	mean sea level
µg/l	micrograms per liter
µg/100 cm^2	micrograms per 100 square centimeters
NACIP	Navy Assessment and Control of Installation Pollutants
NC	Nitrocellulose
NCEA	National Center for Environmental Assessment
NDWIH	Naval District Washington, Indian Head
NEESA	Naval Energy and Environment Support Activity
NG	nitroglycerine
NOAEL	no-observed-adverse-effect-level
NOS	Naval Ordnance Station
NPL	National Priorities List
NQ	nitroguanadine
NSWC	Naval Surface Warfare Center.
OASQA	Office of Analytical Service and Quality Assurance
OSWER	Office of Solid Waste and Emergency Response
OWAP	Old Waste Acid Pit (Site 14)
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon

PCE	tetrachloroethene
PETN	pentaerythritol tetranitrate
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PSPAS	point source pollution abatement study
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RDA	Recommended Dietary Allowance
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RL	Reporting limit
SERA	screening-level ecological risk assessment
SF	slope factors
SI	Site Inspection
SQL	sample quantitation limit
SSL	soil screening level
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characterization Leaching Procedure
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TSI	thermal system insulation
UCL	Upper confidence limit
UF	uncertainty factor
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compound
WWTP	Waste Water Treatment Plant

SECTION 1

Introduction

This report describes the work performed for, and the results of, the remedial investigation (RI) conducted at the Lab Area (Sites 15, 16, 49, 50, 53, 54, and 55) at Naval District Washington, Indian Head (NDWIH), in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy, as Contract Task Order (CTO) 0066 under U.S. Navy Contract N62470-95-D-6007.

1.1 Objectives and Scope of Work

The objectives of the RI were presented in the work plan [Brown & Root Environmental (B&RE), 1997] and the site-specific work plan (CH2M HILL, 2001) as:

- Characterize the nature, extent, and concentrations of site-related contaminants in surface soil, subsurface soil, manhole and wetland sediments, and surface water, and determine the rate of migration of site-related contaminants in the environment;
- Remove the Chemical Disposal Pit at Site 49; and
- Identify actual or potential human or environmental receptors and potential contaminant migration pathways.

The specific activities for the Lab Area described in this report are the Spring 2001 field investigation activities, including surface and subsurface soil sampling, sewer sediment sampling, and wetlands surface water and sediment sampling.

1.2 Report Organization

The Lab Area RI Report contains a summary of the data collected during the RI and previous investigations at the site, presents an interpretation of the data, and documents the nature and extent of contamination for affected media. Contaminant-migration pathways and transport mechanisms for affected media are evaluated. The report also presents an assessment of the human health and environmental risks associated with current site conditions and recommendations for further activities at the site.

The report is divided into seven sections followed by the appendices:

- **Section 1—Introduction:** Describes the objectives, scope of work of the RI, organization of the report, facility background and physical setting, site description, and environmental history.
- **Section 2—Remedial Investigation Activities:** Provides details of the sampling and data-gathering methods used during the field activities.

- **Section 3—Nature and Extent of Contamination:** Describes the nature and extent of contamination found in soil, sediment, and surface water from the past investigations and the RI activities.
- **Section 4—Contaminant Fate and Transport:** Describes contaminant migration at the site in the context of the mobility and persistence of the contamination.
- **Section 5 - Human Health Risk Assessment:** Describes the effects of the contamination on human health.
- **Section 6—Ecological Risk Assessment:** Describes the effects of the contamination on the environment.
- **Section 7—Summary and Conclusions:** Summarizes the results of the RI and the risk posed to human health and the environment based on the nature, extent, fate, and transport of contaminants on the site.

All figures and tables are located at the end of each section for continuity. The appendices contain the raw analytical data obtained during the RI and previous investigations, copies of the Chain-of-Custody forms for the samples collected, the human-health and environmental risk assessment tables of calculations, and manifests for the handling and disposal of investigation-derived waste.

1.3 Facility Background and Physical Setting

This section provides an overview of significant features and history of NDWIH and the Lab Area. Similar information on NDWIH and other sites at the facility is provided in several other documents [Naval Energy and Environment Support Activity (NEESA), 1988; Brown and Root, April 1997].

1.3.1 Facility Mission and Surrounding Land Use

NDWIH is a military facility located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, D.C. (Figure 1-1). The facility provides services, research, development, testing, and evaluation in energetics (Brown & Root, April 1997).

NDWIH consists of the main installation on the Cornwallis Neck Peninsula and the Stump Neck Annex. The main installation contains approximately 2,500 acres. Slightly less than 1,000 additional acres are located across Mattawoman Creek at the Stump Neck Annex. The main installation is bounded by the Potomac River to the northwest, west, and south, Mattawoman Creek to the south and east, and the town of Indian Head to the northeast. The main installation includes Marsh Island and Thoroughfare Island, which are located in Mattawoman Creek. Elevations range from sea level to 111 feet on Cornwallis Neck.

The Lab Area addressed in this RI report is located on the main installation.

1.3.1.1 Current and Historical Uses of NDWIH

NDWIH was established in 1890 and is the Navy's oldest continuously operating ordnance station. At various times during its operation, NDWIH has served as a gun and armor

proving ground, a powder factory, a propellant plant, and a research facility. The U.S. Government purchased Stump Neck Annex in 1901. The property provided a safety buffer for the testing of larger naval guns that were tested by firing into the Potomac River, and at Stump Neck.

The Indian Head installation was enlarged by another 1,160 acres of adjacent land in 1918, during World War I. This expansion included the purchase of Hopewell Farm and Hog Island, which was at that time an islet in Mattawoman Creek and has since become attached to the Cornwallis Neck peninsula. When the Dahlgren Naval Proving Ground was established as a separate command in 1932, NDWIH was re-designated the Naval Powder Factory (Parsons 2000).

The production of gunpowder and development of new explosives during the onset of World War II resulted in the construction of several new facilities at Indian Head, as well as the construction of Route 210 as a Defense Access Road in 1943. Development and improvements at Indian Head continued throughout the 1950s and 1960s, and in 1966, NDWIH was renamed the Naval Ordnance Station (NOS). Rum Point, an 80-acre promontory in Mattawoman Creek near Stump Neck, was also acquired in this year. Bullitt Neck was obtained in five small acquisitions between 1965 and 1966, in order to meet safety and security needs arising from explosive magazines on the Indian Head station (Parsons, 2000).

After the Vietnam conflict, the mission of NDWIH shifted from primarily a production facility to a highly technical engineering support operation. In 1987, the NOS was established as a Center for Excellence to promote technological excellence in the following specialized fields: energetic chemicals; guns, rockets and missile propulsion; ordnance devices; explosives; safety and environmental protection; and simulators and training (Parsons, 2000). Current military land use includes operations and training; production; maintenance and utilities; research, development, testing and evaluation; explosive storage; supply and non-explosive storage; administration; community facilities and services; housing; and open space.

Forest stands comprise approximately 47 percent, or 1,603 acres, of NDWIH and include pine, pine-hardwood, and hardwood forest cover types. Recreation areas at Indian Head include approximately 1,150 acres of designated hunting areas, approximately 2 miles of shoreline fishing areas, and 1.5 miles of nature trails.

1.3.1.2 Surrounding Land Uses

NDWIH is generally surrounded by commercial, residential, and State Park land to the east and south of the main installation and Stump Neck Annex. The town of Indian Head is located just east of NDWIH where most residential developments are located. The Indian Head Highway (Route 210) extends eastward from NDWIH main gate, attracting businesses and providing access to residential areas off the main highway. The Potomac River borders the main installation to the north and west, and Stump Neck to the west. Mason Neck National Wildlife Refuge is located across the Potomac River, north of the main installation. The Mattawoman Natural Environment Area is state-owned property located along the southern edge of Mattawoman Creek east of the main installation.

1.3.2 Physiography and Geology

NDWIH lies within the Atlantic Coastal Plain physiographic province and is underlain by unconsolidated sand, gravel, and clay from the Pleistocene and Cretaceous Periods. The soil in this area consists of silty and sandy loams, with minor amounts of gravel. The soils tend to have low permeability and low shrink-swell potential. Four dominant soil associations are found at Indian Head [United States Department of Agriculture (USDA), Soil Conservation Study (SCS) 1974]:

- Beltsville-Gravelly Land-Bourne Association—The soils within this association are level to moderately sloping, moderately well-drained and loamy, and moderately deep. They also include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Beltsville-Exum-Wickham Association—This association is characterized by level to moderately sloping, moderately well-drained and well-drained loamy soils. Soils within this association are moderately deep, and include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- Evesboro-Keyport-Elkton Association—This association is characterized by level to moderately sloping, excessively drained, sandy soils and moderately well-drained and poorly drained, level to gently sloping, loamy soils with clayey subsoil.
- Bibb-Tidal Marsh-Swamp Association—This association is characterized by level or nearly level, poorly drained, and generally located on floodplains and in miscellaneous unclassified wetlands.

1.3.3 Surface Water and Drainage

Major water bodies at Indian Head include the Potomac River, Mattawoman Creek, and Chicamuxen Creek. The Potomac River flows almost 400 miles from its headwaters in the Allegheny Mountains of West Virginia. Near Indian Head, the Potomac broadens and becomes saltier from the increasing influence of the Chesapeake Bay. Salinity ranges from 0.01 to 3.0 parts per thousand near NDWIH, with the highest salinity values recorded during dry summer months. Mattawoman and Chicamuxen Creeks are tidal tributaries to the lower Potomac River. Chicamuxen Creek is more saline than Mattawoman Creek since it is more strongly influenced by the estuarine waters of the lower Potomac River.

The Potomac River bounds Cornwallis Neck to the north and northwest. Due to the topography of the peninsula, most of the surface water drainage on Cornwallis Neck flows into Mattawoman Creek, which forms its southeastern boundary. The Stump Neck peninsula is bounded by Mattawoman Creek to the north, the Potomac River to the northwest, and partially by Chicamuxen Creek to the southeast.

The Patapsco Formation aquifer supplies NDWIH with the majority of groundwater required for production (over 100 feet below the ground surface at the Lab Area; USGS, 1997). It is recharged chiefly through precipitation and the water filters through the soil and is held primarily in sandy/gravelly formations (Parsons, 2000). A single production well, Well 16A is screened in the deeper Patuxent aquifer. The nearest operating production well to the Lab Area is Well 2A, screened in the Patapsco aquifer, and located approximately 1,100 feet northeast of the Lab Area.

There is an emergent wetland located in the southeast portion of the Lab Area (refer to Figure 1-2). The shape and size of the wetted area associated with the wetland changes depending on precipitation (and the subsequent saturation of the soil), condensate from nearby aboveground steam pipes, and leaking freshwater pipes that lie beneath this area (Shawn Jorgensen and Heidi Morgan, NDWIH Environmental). The approximate limits of the wetland in the Lab Area shown in Figure 1-2 (and subsequent figures) are based on field observations of the wetted conditions of the area, soil type, and vegetation, at the time of the work plan phase of the RI (CH2M HILL, 2001); however, the approximate limits sufficiently detail the shape and size of the amorphous wetland.

1.3.4 Climatic Conditions

NDWIH lies in the humid temperate continental climatic zone of the eastern United States. This zone has hot, humid summers, and relatively mild winters. Due to its proximity to the Potomac River and its tributaries, NDWIH experiences less extreme temperatures, higher precipitation, and higher humidity compared to inland areas. The average daily maximum temperature is 67.5 degrees Fahrenheit (°F), while the average daily minimum temperature is 45°F. The warmest part of the year is in late July and the coldest is in late January and early February. The growing season is approximately 190 days, from mid-April through mid-October (USDA SCS 1974).

1.4 Site Overview, History, and Previous Environmental Investigations

In June 1982, NEESA conducted an Initial Assessment Study (IAS) at NDWIH. Submitted in May of 1983, the report evaluated the various sites at NDWIH to determine if a potential threat to human health or the environment existed. The report identified five sites (i.e., Sites 5, 6, 8, 12, and 25) as exhibiting a potential threat. A Navy Assessment and Control of Installation Pollutants (NACIP) Confirmation Study (CS) was conducted at three of these sites (i.e., Sites 5, 8, and 12) and was published in September 1985 by CH2M HILL. Removal Actions were subsequently conducted at Sites 5 and 8. An RI was completed at Site 12 in March 1999 and a Feasibility Study (FS) for Site 12 was completed in January 2001.

A Preliminary Assessment (PA) Report was prepared by NEESA in January 1992. The report evaluated an additional 17 sites (Sites 39 to 55). All but two sites, Sites 51 and 52, were recommended for further work. As a follow-up to the supplemental PA, a Site Inspection (SI) was conducted at Sites 39 through 50, 53, 54, and 55 in two phases. Phase I focused on Site 42 (Olsen Road Landfill). Phase II focused on the remainder of the sites. Based on the results of the SI, all the sites were recommended for further study.

A Hazardous Ranking System (HRS) Final Scoring report was conducted and submitted by Ensafe/Allen & Hoshall (E/A&H) in April 1994. The HRS Report identified the Activity as scoring 50, above the 28.5 cut-off score. Therefore, NDWIH was proposed to the NPL on February 13, 1995, and was officially placed on the list on September 29, 1995.

Sites 49, 50, and 53 were previously investigated as part of Phase II of the SI. Sites 15 and 16 (Building 600 sewers and Buildings 103 and 502 sewers) have not been specifically investigated, although they are encompassed by Site 53. The results from the previous

investigations were screened against the USEPA Region III screening levels [i.e., Risk Based Concentrations (RBCs) and Soil Screening Levels (SSLs) published by USEPA Region III] in the previous reports. Three of the four sites were qualitatively determined to be potentially ecologically sensitive, and the data for those sites were additionally evaluated against the USEPA Region III Biological Technical Assistance Group (BTAG) screening levels for ecological risk evaluation.

The specific IR Sites covered in this RI are NDWIH Sites 15, 16, 49, 50, 53, 54, and 55. As a result of similar historic usage, proximity, the sharing of sewer utilities, and overlapping field investigations, it was decided by the U.S. Navy, Maryland Department of the Environment (MDE), and the USEPA in May 2000 to simply refer to the area encompassing Sites 15, 16, 49, 50, 53, 54, and 55 as the "Lab Area." The Lab Area is located in the northeastern area of NDWIH (Figure 1-3). The approximate boundary of the Lab Area and the various sites it contains are shown in Figure 1-2. The Lab Area sewer lines and manholes are shown in Figure 1-4.

The Area around the buildings consists of paved roads, parking areas and lawn. The buildings are generally clustered near the top of a gentle hill that slopes downward towards the southeast and south. An emergent wetland is located at the low point of the Lab Area.

1.4.1 Site 15—Mercury Deposits in Manhole, Fluorine Lab

Site 15 includes the Fluorine Laboratory (Building 502) and the Surveillance/Sample Control Building (Building 103), constructed in 1942 and 1902, respectively. Building 502 housed a laboratory to develop, provide, and analyze bench scale quantities of experimental chemicals and fuels. The wide variety of products and processes developed in Building 502 required a wide variety of equipment, such as water aspirators and condensers of different sizes and capacities, as well as jacketed reactors and vessels up to 50-gallons capacity.

Building 103 contained facilities to analyze raw materials and manufactured propellants for surveillance tests. Laboratory equipment containing mercury was reportedly used at different times throughout the history of Building 103. The equipment included nitrometers, pycnometers, talianis, and thermometers. The wastewater from this facility consisted of water, acetone, and alcohol used to wash laboratory glassware.

The wastewater from Buildings 502 and 103 was discharged through underground pipes and combined in a storm drain manhole approximately 100 feet from Building 502. This manhole is designated "B" on Figure 1-4. From this manhole, the wastewater flowed in a southeasterly direction, eventually emptying into the Mattawoman Creek. Manhole "B" received wastewater discharge 4 days per week between 1942 and the late 1980s.

Contaminants known to be in the wastewater included mercury, lead, total suspended solids, and oil/grease. Combined wastewater discharges from Buildings 502 and 103 ranged from 92 gallons per day to 2,160 gallons per day, resulting in a total discharge of approximately 64 pounds of lead and less than one pound of mercury (over the 40-year period during which the wastewater was discharged in this manner) (NEESA, 1983).

Site 15 was included as part of the IAS for NDWIH performed by NEESA in 1983, and the Phase II RCRA Facility Assessment performed by A.T. Kearney, Inc., in 1988. Although

these reports thoroughly outlined the site background, no environmental sampling was performed in either the IAS or the Phase II RCRA Facility Assessment.

The first sampling performed at Site 15, discussed briefly in the 1992 NEESA PA, included the removal of 10 pounds of mercury from Manhole B in 1969. Manhole B was considered part of Site 53 in the PA; however, Manhole B is now also included in Site 15 (Figure 1-4).

In the summer of 1981, NDWIH personnel removed small quantities of mercury from Building 502 floor drains (NEESA, 1983). Team site reconnaissance indicated no evidence of mercury or lead precipitates in either the manhole or ditch, nor any signs of stressed vegetation near the buildings. In 1985, NDWIH Public Works contracted for the replacement of the two sinks in Building 103. After replacing the two sinks, the contractor reported to Public Works that the sinks connected to a single drain line that discharged to the soil beneath the building, and there was no existing connection to a storm or sanitary sewer system (NEESA, 1992). Prior to this, it was believed that the sink discharge line connected to a sewer from Building 102 before connecting to Manhole B. This configuration is described in the 1981 Point Source Pollution Abatement Study (PSPAS) by Indian Head (NOS Indian Head, 1981). After the discovery of the discharge to the soil, a 4-inch diameter polyvinylchloride (PVC) pipe was installed from the sink drainage line to Manhole "A," west of Building 102, as shown in Figure 1-4.

Sampling was also conducted during the SI Study performed by E/A&H in 1992 (submitted in 1994). The study was performed to determine if contamination was present in the surface soil beneath Building 103. The surface soil in the crawl space under Building 103 was designated as Site 50 (refer to Section 1.4.4).

1.4.2 Site 16—Laboratory Chemical Disposal, Building 600

Site 16 consists of the sewers draining the Research and Development Building (Building 600). Built in 1944, Building 600 contained chemical research laboratories and division offices. Reportedly, waste chemicals were disposed of into the plumbing system where they combined with sanitary sewage and flowed to the sewage treatment plant. Approximately 80 chemical compounds were generated or procured by this facility on an annual basis. Chemicals used in quantities exceeding 10 gallons per year included acids, amines, cyanide compounds, and both chlorinated and non-chlorinated solvents. Other materials used in Building 600 in smaller quantities included alkalis, alcohols, aldehydes, metals (i.e., zinc, iron, cadmium, lead, and mercury), and asbestos.

Each individual laboratory within Building 600 generally maintained an area for disposal of waste materials. The design of these areas varied according to the type of waste generated by the specific laboratory (e.g., solid, liquid, explosive, etc.). The wastes were stored in small quantities in bags or containers prior to disposal. The storage locations were indoors at Building 600 over concrete floors. According to the lab representatives, each laboratory generated very small quantities of wastes that were typically collected and disposed of through on-site units (e.g., the burn point) or containerized and transported to the permitted RCRA hazardous waste storage facility in Building 455.

The wastes managed at Building 600 were laboratory wastes including hydrochloric and sulfuric acids, dimethylamine, acrylonitrile, chlorine, methyl chloride, chloroform, carbon

tetrachloride, acetaldehyde, dioxane, cyclohexane, dimethyl formamide, toluene, pyridine, and butyl acetate.

Analysis of the wastewater from Building 600 showed detections of amines, metals (i.e., cadmium, lead, zinc, copper, mercury, silver), cyanides, nitrate esters, trichloroethylene (TCE), and methylene chloride. Mercury, zinc, and silver were also found to be present in low concentrations (NOS Indian Head, 1981).

Other than the screening of the wastewater generated at Building 600, there have been no environmental investigations performed specifically for Site 16. Site 16 was included as part of the IAS performed by NEESA in 1983, and the Phase II RCRA Facility Assessment (A.T. Kearney 1988). Although these reports thoroughly outline the site background, no environmental sampling was performed during the IAS or Phase II RCRA Facility Assessment.

1.4.3 Site 49—Chemical Disposal Pit

The Chemical Disposal Pit, located in the Lab Area, is designated as Site 49. The site consists of a circular concrete pit, approximately 2.5 feet in diameter and 3 feet deep, northwest of Building 444. The pit was designed to dispose of laboratory containers without exposing personnel to the contents. To dispose of laboratory waste in laboratory containers, the containers were placed on a steel grate in the pit. A metal plate was dropped on the containers. The fragments of shattered glass were caught in a wire basket below the steel grate, and the contents of the containers collected in the bottom of the pit and drained from the pit via a drain line to the sanitary sewer system. Reportedly, the pit received limited use until the early 1970s, when the container crushing hardware was removed. The concrete pit was still structurally sound with no visible fractures before its removal in May 2001 (refer to Section 2.1.5). Note that this Chemical Disposal Pit (Site 49) is different from the Old Waste Acid Pit (OWAP), Site 14 (NEESA, 1983; NEESA, 1992). The OWAP was approximately 15 feet to 20 feet deep with rocks placed on the bottom, and was reportedly filled with concrete in 1975 (NEESA, 1992).

According to the PA (NEESA, 1992), a drain line exited on the south side of the pit and connected the pit to the sanitary sewer Manhole 473, as shown on a Bureau of Yards and Docks drawing (Drawing Number 670,579) in that report; however, during a visual inspection of Site 49 in 1996, another drain line entering the pit from the north was discovered. This line was thought to connect to sanitary sewer Manhole 472, as shown on a Bureau of Yards and Docks drawing (Drawing Number 15,699, 1964), which was reviewed by NEESA during the 1992 PA. Section 2.1.5 describes the Chemical Disposal Pit removal activity, which confirmed the existence of this drain line (and subsequently, found that the OWAP was under the Chemical Disposal Pit; refer to Sections 1.4.9 and 2.1.5).

Sampling was conducted by E/A&H in 1992 to determine if contamination was present in the solids in the bottom of the pit or in the shallow soil zone adjacent to the pit from past disposal methods. A summary of the sampling conducted during the 1992 E/A&H SI is provided in Table 1-1, sediment sample detections are provided in Table 1-2, and subsurface soil detections are provided in Table 1-3. The soil boring and sediment sample locations and analytical results that exceeded screening criteria are provided in Figure 1-5. Sample 49DS01 is a sediment sample that was collected from the Chemical Disposal Pit.

Tetrachloroethene (PCE) was the only volatile organic compound (VOC) detected in the pit sediment, while six semi-volatile organic compounds (SVOCs) were detected in pit sediment at varying concentrations. Eighteen metal constituents were detected in the pit sediment, including arsenic, lead, and mercury. Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) was the only explosive derivative analyte detected.

Eighteen metal analytes were detected in the subsurface soil samples (collected at three different depths at one location). The boring indicated that the shallow soil zone ended at approximately 28 feet below ground surface (ft-bgs).

The data was compared against the USEPA Region III RBCs. Arsenic was detected at a concentration of 10.4 mg/kg in the pit sediment, exceeding screening criteria. Arsenic was detected at only 5.5 mg/kg in an adjacent subsurface soil sample from 15 feet to 17 ft-bgs. Mercury was detected at a concentration of 2,690 mg/kg in the pit sediment, also exceeding screening criteria.

1.4.4 Site 50—Building 103 Crawl Space

The Building 103 Crawl Space (Site 50) is located in the Lab Area. Building 103 is a small one-story building with a concrete block foundation, built in approximately 1902. Laboratory equipment containing mercury was reportedly used in Building 103 at different times. The equipment included nitrometers, pycnometers, talianis, and thermometers.

Spent mercury handling procedures at Building 103 (and other buildings in the Lab Area that used mercury) consisted of pouring spent mercury into “slop jars,” followed by running tap water into the jar over a sink to remove sulfuric acid from the mercury. Spills often occurred while transferring the spent mercury from nitrometers or when the slop jars broke. In addition, mercury was likely inadvertently washed out of the jars.

In 1985, while replacing two sinks in Building 103, workers discovered that the two sinks, connected to a single drain line, discharged directly to the soil beneath the building rather than to the storm or sanitary sewer system (refer to Section 1.4.1). After the discovery, a 4-inch diameter PVC pipe was installed from the sink drain line to Manhole A (NEESA, 1992). The quantity of solvents and mercury discharged to the soil from 1902 to 1985 is unknown (E/A&H, 1994).

The crawl space below Building 103 is unpaved and divided in half by a central load-bearing wall, running approximately east-west. The ground in the northern part of the crawl space is relatively flat; however, the southern section slopes to the southwest. The entrance to the crawl space is along the southern wall. The drain from the two sinks was located in the southwest corner of the northern section of the crawl space. A small ditch exists along the west wall of the southern section of the crawl space. It drains to a shallow depression in the southwest corner, forming a collection point for runoff.

The area around Building 103 is similar to the ground surface in the crawl space. The topography at the northern end of the building is relatively flat, while the ground slopes to the south at the southern end of the building.

Sampling was conducted during the E/A&H SI to determine if contamination was present in the surface soil beneath Building 103. A summary of the surface soil sampling conducted in the Building 103 crawl space during the SI is presented in Table 1-4, while the surface soil

sample detections are presented in Table 1-5. The sample locations and analytical results that exceeded the screening criteria are provided in Figure 1-6.

Two VOCs [acetone and 1,1,1-trichloroethane (TCA)] were detected in the surface soil samples, but acetone was also detected in the laboratory method blank. Eight metals were detected in the surface soil, including arsenic, lead, and mercury. Only arsenic was detected above RBCs and SSLs, with concentrations ranging from 5 mg/kg to 18.1 mg/kg.

1.4.5 Site 53—Mercury Contamination in the Sewage System

Site 53 (the Mercury Contamination in the Sewage System) consists of the sewage system for the Lab Area. The sewage system consists of both the storm sewer lines and the sanitary sewer lines from several buildings in the area.

According to Indian Head Public Works personnel, all sewage generated by the Lab Area was piped directly to the Mattawoman Creek starting in the early 1900s. This practice was altered in the late 1960s when the sanitary and storm sewer systems were separated. Sewage Treatment Plant No. 2 (consisting of Buildings 1470 – 1474) was built in the early 1970s to support sanitary sewage from the Lab Area (and other locations). Sanitary sewage from buildings in the Lab Area that had bathroom facilities (i.e., Buildings 101, 102, 303, 556, and 600) was routed to Sewage Treatment Plant No. 2.

In the early to mid-1980s, Sewage Treatment Plant No. 1 was upgraded to support additional sanitary sewage. Pump stations were installed to allow sanitary sewage from the Lab Area to be routed to the newly upgraded Sewage Treatment Plant No. 1. Subsequently, Sewage Treatment Plant No. 2 was closed after the sanitary sewage was rerouted. In the early 1990s, Building 103 and 502 were connected to the Industrial Wastewater Treatment Phase I System (IWPS), designed to collect operations wastewater for analysis before discharge to Sewage Treatment Plant No. 1.

Laboratory workers reported that approximately a liter of mercury was lost per month down the sinks from Building 102. Over the 77-year period that the Building 102 laboratory operated without mercury traps on the sinks (1909—1986), up to 28,000 pounds of mercury could have been discharged to the drain lines (NEESA, 1992). Additional quantities of mercury may have been disposed of down the drain lines from similar mercury handling and disposal procedures practiced at the other laboratory buildings within the Lab Area.

In 1969, approximately 10 pounds of mercury were recovered from Manhole B, south of Building 103 (refer to Figure 1-4; also refer to Section 1.4.1). In early 1989, approximately 1 pound of mercury was recovered from Manhole A, west of Building 102 (refer to Figure 1-4). Both of these manholes have drain line connections to Building 102.

After mercury was discovered in the Manhole A in 1989, other manholes in the vicinity and down-line of the laboratory buildings were inspected for mercury; however, no visible mercury was discovered. Since then, the manholes in the vicinity and down-line of the Lab Area have been regularly inspected for signs of visible mercury. In addition, the sewer lines in the area of Building 102 were blocked off with sandbags, and mercury traps were installed on the lines.

In late 1988, a video survey was performed to determine the condition of the gravity sewer lines in the Lab Area. The sewer lines “in the vicinity of the laboratory buildings” were

found to be in poor condition and in need of repair or replacement (NEESA, 1992). The vitrified clay and terra-cotta pipes were either broken, cracked, sagging, separated, or in some cases, collapsed. Therefore, it was thought that mercury might have contaminated the soils surrounding the sewer lines. Some time between the 1988 video survey and the 1998 manhole survey (conducted by RJN Group), several of the most damaged runs of sanitary sewer were lined (refer to Sewer Survey Summary in Appendix A). Also, free phase mercury was reportedly encountered by a contractor making repairs to the sewer system in 1998.

Also in late 1988, mercury was measured in sanitary sewage sludge from the Sewage Treatment Plant No. 1 at levels up to 150 parts per million (ppm) (NEESA, 1992). The maximum allowable amount of mercury in Class I sanitary sewage sludge is 10 ppm (NOS Indian Head, 1988). Mercury levels in the Sewage Treatment Plant No. 1 sludge dropped below 10 ppm between 1993 and 1996, and have remained within allowable levels since. The elevated mercury levels detected in the sludge in 1988 can probably be attributed to the disturbance of the damaged pipe sections during lining operations, and the subsequent disturbance of mercury trapped in those lines. The decrease in mercury contamination may also be attributed to the cleaning and relining of the Lift Station 11 during this time. Appendix B contains the sewage plant sludge analytical results for the period of 1987 to 1999, as well as correspondence pertaining to the results.

Sampling was conducted during the E/A&H SI to determine if contamination existed because of disposal procedures (in conjunction with a faulty sanitary sewer system). A summary of the sampling conducted during the E/A&H SI is presented in Table 1-6. Sediment samples were collected from within the identified manholes near Buildings 102 and 103, and subsurface soil samples were collected from soil borings advanced in the general vicinity of the sewer lines. The locations of the sediment samples and soil borings, along with the analytical results that exceeded the screening criteria, are presented in Figure 1-7. Sample 53DM08 in Figure 1-7 is a sediment sample.

Soil borings were installed as close as possible to the sanitary line in the areas recommended in the PA (i.e., between Manholes 469 and 472, between Manholes A and 471, and between Building 303 and Manhole 471). Soil samples collected from boring 53SB01 were analyzed for VOCs, SVOCs, total inorganics, and total petroleum hydrocarbons (TPH). No VOCs, SVOCs, or TPH were detected. Arsenic was detected in soil sample 53SB01 at 9.3 mg/kg, above screening criteria. Soil samples collected from borings 53SB02 through 53SB13 were analyzed for mercury and explosives, but had no detections.

Sewer sediment samples were collected from storm drain and sanitary manholes near the laboratories. Thirteen manholes were to be sampled; however, only four of the manholes contained adequate sediment volume for the analyses. Sediment samples were analyzed for mercury and explosives (refer to Table 1-7). Mercury was detected in three sediment samples in Manholes S083 (81.4 mg/kg), B (52 mg/kg) (where mercury was recovered in 1969), and 473 (2.5 mg/kg). Mercury was not detected in the sediment collected from Manhole "C." Eight explosives were also detected in Manhole B.

No monitoring wells were installed during the SI, since groundwater was not encountered. During the fieldwork, 13 borings were installed: 10 borings at a depth of 12 ft-bgs and three borings at depths of 30 ft-bgs to 40 ft-bgs. No shallow water-bearing zone was encountered in any of the borings. One of the deep borings (53SB02) was located near the southeastern

edge of Thames Road, northwest of Building 444. The SI described a marker bed at 41 ft-bgs in soil boring 53SB02, indicating the bottom of the Lowland Deposits, suggesting that no shallow water-bearing zone should be expected. The same marker bed was found in a boring located between Buildings 881 and 444 (49SB01) at a depth of 32 ft-bgs (note that the ground surface at 53SB01 is 6 feet to 7 feet higher than at 49SB01). A third boring (53SB13), located approximately 60 feet south of the southeastern corner of Building 502, encountered the marker bed at 35 ft-bgs. The SI described the marker bed as a unit of the Tertiary Brandywine Formation. The unit was a medium to fine-grained reddish to white quartz sand; moderately cemented and very hard; and impenetrable by split-spoon sampling.

Soil samples collected during the SI were uniform throughout the Lab Area, consisting of stiff to hard brown and green silty clay, with little moisture. Blow counts averaged 40 blows per foot. Test results from two Shelby Tube samples indicated hydraulic conductivities of 7.1×10^{-8} centimeters per second and 1×10^{-6} centimeters per second.

Soil borings 53SB0103 and 53SB1303 were analyzed for cation exchange capacity (CEC) and total organic carbon (TOC). The CEC values were within the typical range for silty clays [i.e., 10 to 40 milli-equivalents per 100 grams (meq/100g)] (Drever, 1988, E/A & H, 1994). A higher CEC value indicates that more sites are available for bonding. A high number of bonding sites increases the potential for adsorption of contaminants and a retarded rate of contaminant migration. CEC values are affected by several factors, including composition of clay minerals, pH, and the nature of the cations present. TOC concentrations were also in the average range for silty clays. The potential for a contaminant to partition to or become absorbed to the soil particles increases as TOC content increases. That is, the potential distance for contamination migration through the soil profile decreases with increasing TOC. The SI concluded that these results indicated low potential for contaminant migration in site soils.

The SI Report concluded the following: If contamination, particularly mercury, had entered the soil system via the sewer lines, the extent of contamination would be limited to the soil in contact with joints and/or fractures in the pipes by the natural soil properties.

1.4.6 Site 54—Building 101 Mercury Contamination

Building 101, located in the Lab Area, is designated as Site 54. In the mid-1980s, an NDWIH employee in Building 101 detected mercury droplets and an organic solvent odor in the basement office when solvents were discharged through the pipe system (NEESA, 1992), suggesting a potential leaky drainage pipe. In January 1990, several droplets of mercury were discovered resting on the insulation of a steam pipe located in the southeast corner room of the basement in Building 101 (NEESA, 1992). When NDWIH Safety Office personnel began removing the drop ceiling tiles, mercury vapors were detected in the breathing zone, but no visible signs of mercury on the ceiling tile tracks were observed (NEESA, 1992).

During the SI sampling conducted in August 1992, the carpeted basement floor in Building 101 appeared to be stained in the northwest corner. Several ceiling tiles and the sheetrock wall also appeared to be stained. There were no visible mercury droplets on the horizontal surfaces that were sampled. Mercury vapors were monitored during the sampling process (E/A&H, 1994): There were two brief intervals when mercury vapors

were as high as 0.33 parts per billion (ppb), but no significant levels of mercury vapors were detected during the remainder of the sampling process.

Sampling was conducted to determine if select horizontal surfaces, bulk building materials, and the concrete floor had been contaminated by mercury spills and/or releases. A summary of the sampling and analysis conducted during the SI is presented in Table 1-8, while sampling results are presented in Table 1-9.

Five wipe samples, five bulk materials samples, and five concrete samples collected from the basement floor were used to characterize this site (E/A&H, 1994). The mercury wipe sample concentrations ranged from 0.53 micrograms per 100 square centimeters ($\mu g/100\ cm^2$) to 75.4 $\mu g/100\ cm^2$ (E/A&H, 1994). The overall range of mercury concentrations detected in the bulk materials samples was 0.45 milligrams per kilogram (mg/kg) to 776 mg/kg. The highest reported level of mercury for wipe and bulk material samples was detected in samples collected adjacent to one another at the east wall of the building, suggesting a local "hot spot" (E/A&H, 1994).

Mercury detections in the concrete samples ranged from 0.21 mg/kg to 0.59 mg/kg, with an average concentration of approximately 0.46 mg/kg. No explosives were detected in the concrete samples (E/A&H, 1994).

The E/A&H SI (1994) recommended that this area remain closed to personnel. Non-impervious materials (i.e., metal pipes and other metal materials, only) could possibly be decontaminated and reused. Other porous building materials (i.e., ceiling tiles, sheet rock, floor tile, etc.) would likely require removal and disposal.

1.4.7 Site 55—Building 102

Building 102 is located in the center of the Lab Area, and is designated as Site 55. Building 102, constructed in 1909, was used as a laboratory for testing nitrocellulose (NC) by the nitrometer method. Other mercury-containing equipment including pycnometers, talianis, vacuum stability testing equipment, and thermometers were used to determine the densities and sensitivity of propellants throughout the 80 years of laboratory operations in Building 102.

On October 6, 1987, metallic mercury was discovered dripping from the ceiling onto the sink table top of the coffee mess, located in the northern end of the basement of Building 102. The source of the mercury was believed to be the equipment located on the first floor (NEESA, 1992). Ceiling tiles were removed, revealing the original tongue and groove wood flooring. A layer of asbestos sheeting was found beneath this wood flooring. Plastic sheeting was placed under the ceiling to capture the mercury leaking from the wooden floor above. An estimated 2 ounces of mercury leaked onto the plastic sheeting from the wooden floor, necessitating the closure of the northern end of the building to protect the health of employees (NEESA, 1992). Building 102 was abandoned in February 1989, and the water supply to Building 102 was terminated to help alleviate high mercury levels in the sanitary sewage sludge (NEESA, 1992).

Interviews with past facility employees (regarding historical operations of Building 102) revealed that the wooden floor was not sealed with an impervious surface until the early

1960s (NEESA, 1992). According to employee interviews, a major spill occurred upstairs in Building 102 in the early 1960s before the impervious concrete floor was installed.

In the mid-1970s, the nitrometer was moved to the southern room in the basement of Building 102 (NEESA, 1992). The floor drains in the basement were plugged in the early 1980s to prevent the release of mercury in case of a spill (NEESA, 1992).

In 1986, mercury traps were installed in the sinks where mercury was handled. When the "U"-joints were removed to install the traps, the plumber noted "about a teaspoon" of mercury in each U-joint (NEESA, 1992). After the building was closed, the sinks were salvaged for use in other buildings. Additional mercury was found in the piping and U-joints when the sinks were removed (NEESA, 1992).

Sampling was conducted to determine if selected horizontal surfaces, bulk building materials, and the concrete floor were contaminated by mercury spills and/or releases. A summary of the sampling and analyses performed during the E/A&H SI is provided in Table 1-10, and sampling results are shown in Table 1-11.

Mercury wipe sample concentrations ranged from 0.10 μg/100 cm^2 to 368 μg/100 cm^2 (E/A&H, 1994). The location where mercury was detected at 368 μg/100 cm^2 was on the surface of the steam pipe at the divider wall, above the ceiling in Room 2 of Building 102, likely a local "hot spot." Mercury concentrations detected in the bulk material samples ranged from 0.16 mg/kg to 30.4 mg/kg. The mercury concrete sample concentrations ranged from 2.5 mg/kg to 86.8 mg/kg. HMX was detected in two concrete samples in Room 2 at 2,580 μg/kg and 3,830 μg/kg.

As with Building 101, the E/A&H SI (1994) recommended that Building 102 remain closed to personnel. Non-impervious materials (i.e., metal pipes and other metal materials, only) could possibly be decontaminated and reused. Other porous building materials (i.e., ceiling tiles, sheet rock, floor tile, etc.) would likely require removal and disposal.

1.4.8 Other Buildings

In 1993, surface soil samples, randomly collected near Buildings 102, 108, 109A, 444, 556, and 1797 (Building 1797 is not located in the Lab Area), were analyzed for mercury by an NDWIH laboratory. Analyses were performed in accordance with Method 7471 of *Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 2*, November 1990, USEPA Office of Solid Waste. Mercury was detected in all samples, except the Building 556 sample, at concentrations of 0.216 mg/kg to 128 mg/kg (wet weight). The highest concentrations were detected near Buildings 108 (4.05 mg/kg), 102 (25.2 mg/kg), and 444 (128 mg/kg). A 1993 memorandum detailing these results is provided in Appendix C.

Most of the structures in the Lab Area have been used as laboratories or chemical storage at some time during their history. Accounts of various personnel currently or formerly employed in the laboratories have indicated that historical practices, such as disposing of unusable chemicals directly on the ground surface outside laboratory doors, may have led to surface soil contamination in the Lab Area.

Given the evidence that surface soil contamination may be wide spread throughout the Lab Area, the Indian Head Installation Restoration Team (IHIRT) elected to broaden the investigative scope beyond the buildings identified as IR sites in the PA (i.e., Sites 50, 54,

and 55) to include other buildings in the Lab Area. Other buildings included in the Lab Area surface soil study were 108, 108A, 303, 304, 444, 555, 556, 596 and 1348. Limited historical information may be found for Buildings 303, 304, 555, and 596 in the *Summary of Use Report, Buildings 303, 304, 555, and 596*, prepared by Naval Historian James E. Dolph, presented in Appendix D. This report is summarized in Sections 1.4.8.1 through 1.4.8.4, below.

1.4.8.1 Building 303

According to the *Summary of Use Report,* Building 303 was built in 1918 (refer to Appendix D). It served as a chemical laboratory office building from 1918 to 1949. Building 303 was designated a "Production & Safety Office Building" from 1957 to 1959. From 1961 to 1967, Building 303 was designated a "Production Building." As of 1999, Building 303 was used as an office building.

Historical notes in the *Summary Use Report* indicate that a 1940 architectural plan detailed two photographic darkrooms and a general workroom in the basement of Building 303. Additionally, a 1944 architectural plan detailed that all spaces on the first floor were offices; a 1956 architectural plan detailed a paper cutting room, paper dipping machine, and chemical storage room in the basement; and a 1978 architectural plan shows that all spaces in the basement and on the first floor were offices.

1.4.8.2 Building 304

According to the *Summary of Use Report*, Building 304 was built in 1918, with later additions built in 1940 and 1941 (refer to Appendix D). From 1918 to 1949, Building 304 was used as a chemical laboratory storehouse. No record of building use between 1950 and 1957 was found, but it was again described as a storehouse from 1957 to 1961. In 1961, Building 304 also was used as "Retail Outlet #4." As of 1999, Building 304 was still in use as a storehouse, but also contained a wastewater laboratory.

For a hazardous materials survey performed in 1980, and as part of the NOS Oil/Hazardous Substance Contingency Plan in 1986, a list of materials stored in Building 304 (i.e., in 1980 and 1986) was compiled, and is included in the *Summary of Use Report* (refer to Appendix D).

1.4.8.3 Building 555

According to the *Summary of Use Report*, Building 555 was built in 1944 (refer to Appendix D). It served as a "Surveillance Magazine" from 1944 to 1949. From 1957 to 1961, Building 555 was designated "Magazine 2Y2." From 1967 to 1976, Building 555 was used as an "Explosive Test Laboratory." As of 1999, the building was designated as a Magazine and "Explosive Test Laboratory." A 1968 architectural plan proposed renovations associated with "Mixing and Measuring," and a 1974 architectural plan indicated that a "Rolling Mill" was in the building.

For a hazardous materials survey performed in 1980, and as part of the NOS Oil/Hazardous Substance Contingency Plan in 1986, a list of materials stored in Building 555 (i.e., in 1980 and 1986) was compiled, and is included in the *Summary of Use Report* (refer to Appendix D).

1.4.8.4 Building 596

According to the *Summary of Use Report*, Building 596 was built in 1945 (refer to Appendix D). In 1949, the building was used as "Surveillance Magazine #4." From 1957 to 1961, Building 596 was used as "Magazine 2Y1." In 1976 the building was used for "stability testing." As of 1999, Building 596 was designated as a Magazine and "Stability Test Building."

1.4.9 Site 14 – Old Waste Acid Disposal Pit

Site 14, the OWAP, was not included as part of the Lab Area RI; however, the OWAP was thought to be in close proximity to the Lab Area, and, specifically, in close proximity to the Chemical Disposal Pit (Site 49, included in the Lab Area RI). The IAS (NEESA, 1983) and the PA (NEESA, 1992) both described that the OWAP was removed and filled in with concrete in 1975; however the location of the OWAP was not determined.

Since the IAS and PA, further research by NDWIH personnel (as well as the Lab Area RI field investigation) suggested that the Chemical Disposal Pit might have been built on top of the OWAP location. Specifically, an interview with a retired Lab Area worker of 40 years (Baroody, 2001), revealed that after digging out the OWAP and filling it with concrete in the early 1970s, the Chemical Disposal Pit was installed on top of the abandoned OWAP. Refer to Section 2.1.5 for the discussion of the Chemical Disposal Pit removal activity, and the subsequent discovery of the OWAP's location.

1.5 References

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Table 1-1
Ensafe/Allen Hoshall Site Inspection (1994) At Site 49
Sampling and Analysis Approach
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media:	Shallow soil zone (0-6 ft-bgs) Sediment in pit			
Sampling Performed:	**Type**	**Number**	**Sample/Location**	**Total**
	Soil boring (5-7 ft-bgs, 15-17 ft-bgs, and 25-27 ft-bgs)	1	3	3
	Sediment Sample (Surface sample)	1	1	1
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOCs, SVOCs, TAL Inorganics, Explosives		
	Sediment	VOCs, SVOCs, TAL Inorganics, Explosives		

Notes and Abbreviations
Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
ft-bgs = feet below ground surface
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)

Table 1-2
Ensafe/Allen Hoshall Site Inspection (1994) At Site 49
Chemical Disposal Pit Sediment Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Constituent Name	Average Detetected Value	Minimum Detected Value	Maximum Detected Value
Volatile Organic Compounds (µg/kg)			
Tetrachloroethene	90	90	90
Semi-volatile Organic Compounds (µg/kg)			
Pyrene	235	200	270
Fluoranthene	69	65	73
Chrysene	90	59	120
Benzo(a)anthracene	58	52	64
Phenanthrene	78	78	78
N-Nitrosodiphenylamine (1)	265	260	270
Explosives (µg/kg)			
HMX	2.25	2.25	2.25
Total Metals (mg/kg)			
Aluminum	6,950	6,950	6,950
Arsenic	10.4	10.4	10
Barium	393	393	393
Cadmium	4.5	4.5	4.5
Calcium	6,760	6,760	6,760
Chromium	131	131	131
Cobalt	462	462	462
Copper	298	298	298
Iron	23,100	23,100	23,100
Lead	110	110	110
Manganese	1,120	1,120	1,120
Magnesium	938	938	938
Nickel	44.5	44.5	44.5
Potassium	507	507	507
Mercury	2,690	2,690	2,690
Sodium	299	299	299
Silver	16.4	16.4	16.4
Zinc	195	195	195

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)

Table 1-3
Ensafe/Allen Hoshall Site Inspection (1994) At Site 49
Chemical Disposal Pit Subsurface Soil Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Constituent Name	Average Detetected Value	Minimum Detected Value	Maximum Detected Value	Frequency of Detection
Total Metals (mg/kg)				
Aluminum	14,220	8,960	21,300	3/3
Arsenic	3.5	2	5.5	3/3
Barium	46.9	40.6	53.8	3/3
Beryllium	0.8	0.49	1	3/3
Calcium	667	591	771	3/3
Chromium	18.2	15	23.4	3/3
Cobalt	6.8	5.5	7.7	3/3
Copper	13.4	8.8	18.5	3/3
Iron	28,067	23,900	34,600	3/3
Lead	7.1	1.8	11.7	3/3
Manganese	108.7	53.1	171	3/3
Magnesium	763.7	463	1,120	3/3
Nickel	10.4	9.1	12.1	3/3
Potassium	765	605	980	3/3
Sodium	85.2	80.9	88.2	3/3
Silver	1.43	4.2	1.8	3/3
Vanadium	32.7	24.4	41.3	3/3
Zinc	35.8	32.5	37.6	3/3

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
No VOCs, SVOCs, nor Explosives were detected.
mg/kg = milligrams per kilogram

Table 1-4
Ensafe/Allen Hoshall Site Inspection (1994) At Site 50
Sampling and Analysis Approach
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media:	Surface Soil			
Sampling Performed:	**Type**	**Number**	**Sample/Location**	**Total**
	Surface Soil	10	1	10
Analyses Performed:	**Media**	**Analyses**		
	Soil	VOC, SVOC, TAL Inorganics, Explosives		

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)

Table 1-5
Ensafe/Allen Hoshall Site Inspection (1994) At Site 50
Surface Soil Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Constituent Name	Average Detetected Value	Minimum Detected Value	Maximum Detected Value	Frequency of Detection
Volatile Organic Compounds (µg/kg)				
Acetone	530	530	530	1/12
Trichloroethane	10	10	10	1/12
Semi-volatile Organic Compounds (µg/kg)				
Anthracene	41.7	26	65	3/12
2,4-Dinitrotoluene	4,950	4,200	5,700	2/12
Pyrene	96.7	29	280	6/12
Benzo(g,h,I)perylene	46.5	33	60	2/12
Indeno(1,2,3-cd)pyrene	46.5	32	61	2/12
Benzo(b)fluoranthene	96.5	28	150	4/12
Fluoranthene	176.8	28	440	6/12
Benzo(k)fluoranthene	73	20	130	3/12
Chrysene	63.7	28	200	7/12
Benzo(a)pyrene	76	52	100	2/12
Dibenz(a,h)anthracene	37	37	37	1/12
Benzo(a)anthracene	59.2	17	160	5/12
2,6-Dinitrotoluene	290	290	290	1/12
Di-n-butylphthalate	5,350	3,900	6,800	2/12
Phenanthrene	112.5	29	370	6/12
N-Nitrosodiphenylamine (1)	290	280	300	2/12
Carbazole	53	31	75	2/12
Total Metals (mg/kg)				
Iron	25,754	1,780	142,000	11/11
Lead	425.6	61.6	1260	11/11
Mercury	24	1.8	100	11/11
Silver	6.4	4.2	8.6	2/11
Arsenic	8.4	3.4	18.1	11/11
Cadmium	4.8	3	7.2	4/11
Copper	40.36	7.9	155	11/11
Zinc	792.1	125	3,170	11/11

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
No explosives were detected.
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

Table 1-6
Ensafe/Allen Hoshall Site Inspection (1994) At Site 53
Sampling and Analysis Approach
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media:	Shallow soil profile (0-12 feet) Sewer Sediment (sewer manholes)			
Sampling Performed:	**Type**	**Number**	**Sample/Location**	**Total**
	Shallow soil borings (adjacent to sewer lines)	13	1	13
	Sediment sample (Surface Sample)	4	1	4
Analyses Performed:	**Media**	**Analyses**		
	Soil	SB01 - VOCs, SVOCs, TAL Inorganics, TPH SB02 through SB15 - Mercury, Explosives		
	Sediment	Mercury, Explosives		

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)
TPH = total petroleum hydrocarbons

Table 1-7
Ensafe/Allen Hoshall Site Inspection (1994) At Site 53
Sewer Sediment Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample ID	**53DM01**	**53DM02**	**53DM07**	**53DM08**
Manhole Associated with Sample	**S083**	**"B"**	**"C"**	**473**
Constituent Name				
Explosives (µg/kg)				
RDX	BDL	2,670	BDL	BDL
1,3,5-Trinitrobenzene	BDL	516	BDL	BDL
Nitroglycerin	BDL	88,000	BDL	BDL
2,4-Dinitrotoluene	BDL	502	BDL	BDL
2-Nitrotoluene	BDL	975	BDL	BDL
4-Nitrotoluene	BDL	500	BDL	BDL
3-Nitrotoluene	BDL	426	BDL	BDL
PETN	BDL	395,000	BDL	BDL
Total Metals (mg/kg)				
Mercury	81.4	52.0	BDL	2.5

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
BDL = Below detection limit
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

Table 1-8
Ensafe/Allen Hoshall Site Inspection (1994) At Site 54
Sampling and Analysis Approach
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media:	Horizontal surfaces, building materials, concrete floor			
Sampling Performed:	**Type**	**Number**	**Sample/Location**	**Total**
	Wipe (horizontal surfaces)	5	1	5
	Bulk building materials	5	1	5
	Concrete	5	1	5
Analyses Performed:	**Media**	**Analyses**		
	Wipe (horizontal surfaces)	Mercury		
	Building materials	Mercury		
	Concrete	Mercury, Explosives		

Notes and Abbreviations
Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)

Table 1-9
Ensafe/Allen Hoshall Site Inspection (1994) At Site 54
Wipe, Bulk Materials, and Concrete Sample Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sampling Location	Mercury µg/100 cm^2	Mercury mg/kg	Explosives µg/kg
Wipe Samples			
On conduit above ceiling tile in NE corner.	8.6	NA	NA
On drainage pipe above ceiling tile in NE corner.	3	NA	NA
Top right corner of air conditioner, east wall.	75.4	NA	NA
On water line at east wall.	0.53	NA	NA
Steam pipe above ceiling, 10 feet from east wall at northcentral section of room.	14.1	NA	NA
Bulk Samples			
Ceiling tile, above air conditioner at east wall.	NA	776	NA
Pipe insulation, steam pipe above air conditioner at east wall.	NA	0.45	NA
Floor tile, near the center of the east wall, at corner of load column and east wall.	NA	3.5	NA
Pipe mortar, steam pipe elbow on 6-inch steam pipe at east wall.	NA	2.1	NA
Sheet rock, 10 feet from air conditioner, top of north wall.	NA	5.8	NA
Concrete Samples			
Corner 1.5 feet from east wall.	NA	BDL	BDL
Near the center of the area between the north wall and the load column.	NA	0.59	BDL
At drain pipe, north wall.	NA	0.38	BDL
Corner at east wall and load column, below air conditioner.	NA	0.56	BDL
Directly between first two concrete samples.	NA	0.21	BDL

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
BDL = Below detection limits
NA = Not analyzed for respective analysis
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
µg/100 cm^2 = micrograms per 100-square-centimeter-area

Table 1-10
Ensafe/Allen Hoshall Site Inspection (1994) At Site 55
Sampling and Analysis Approach
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media:	Horizontal surfaces, building materials, concrete floor			
Sampling Performed:	**Type**	**Number**	**Sample/Location**	**Total**
	Wipe (horizontal surfaces)	5	1	5
	Bulk building materials	5	1	5
	Concrete	5	1	5
Analyses Performed:	**Media**	**Analyses**		
	Wipe (horizontal surfaces)	Mercury		
	Building materials	Mercury		
	Concrete	Mercury, Nitrate Esters		

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)

Table 1-11
Ensafe/Allen Hoshall Site Inspection (1994) At Site 55
Wipe, Bulk Materials, and Concrete Sample Detections
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sampling Location	Mercury µg/100 cm^2	Mercury mg/kg	Explosives µg/kg
Wipe Samples			
Room 2, floor tile surface, halfway between the sink and the west wall, 2 feet from divider wall.	4.6	NA	NA
Room 2, steam pipe surface at divider wall above ceiling.	368	NA	NA
Room 2, conduit surface at divider wall, near towel dispenser.	0.44	NA	NA
Room 1, copper water line surface at east wall.	1.3	NA	NA
Room 2, floor tile surface 8 feet from divider wall by air conditioner.	0.10	NA	NA
Bulk Samples			
Room 2, sheet rock, top center of divider wall, above sink.	NA	29.6	NA
Room 2, floor tile, center of divider wall, below sink.	NA	30.4	NA
Room 1, ceiling tile, at intersection of divider wall and copper water pipe.	NA	4.6	NA
Room 2, pipe insulation, steam pipe at divider wall.	NA	BDL	NA
Room 2, ceiling tile, near center of room next to second sprinkler from divider wall.	NA	0.16	NA
Concrete Samples			
Room 2, left of doorway between rooms 1 & 2, next to divider wall, under former sink location.	NA	35.2	2,580 (HMX)
Room 2, 1 foot left of above sample, along divider wall.	NA	21.40	3,830 (HMX)
Room 2, next to divider wall, at corner of divider wall and west wall.	NA	86.8	BDL
Room 1, at center of divider wall, at wall.	NA	7.9	BDL
Room 2, below air conditioner.	NA	2.5	BDL

Notes and Abbreviations

Adapted from Site Inspection performed by Ensafe, Allen, & Hoshall (1994)
Higher value from duplicate or original sample is provided, where applicable
HMX = andoxyhydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
BDL = Below detection limits
NA = Not analyzed for respective analysis
mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
µg/kg = micrograms per kilogram
µg/100 cm^2 = micrograms per 100-square-centimeter-area

E062002004WDC<Vicinity Map 2001.fh10>wdc.cac.06.2002

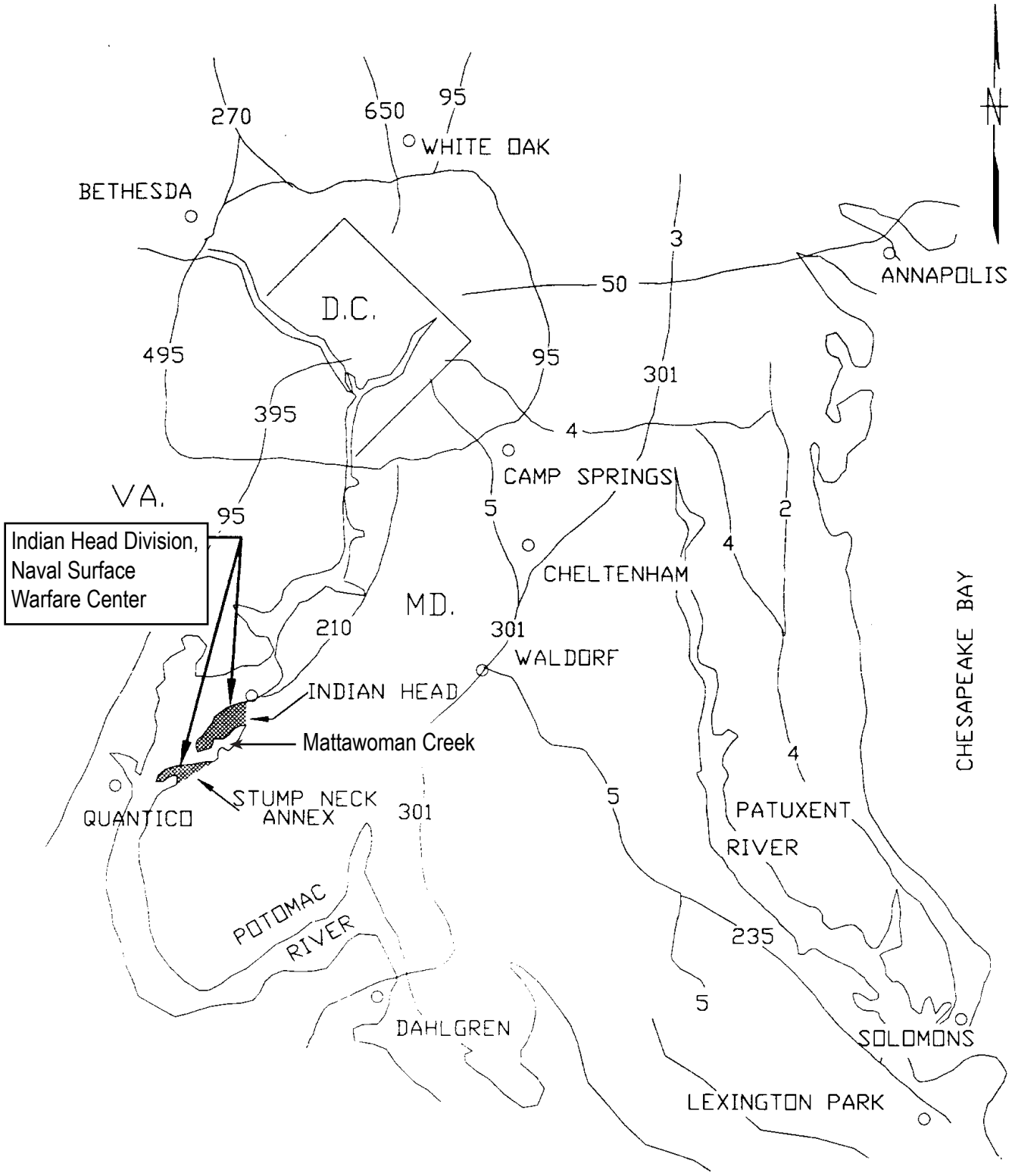

Figure 1-1
Vicinity Map
Lab Area RI
NDWIH
Indian Head, Maryland

CH2MHILL

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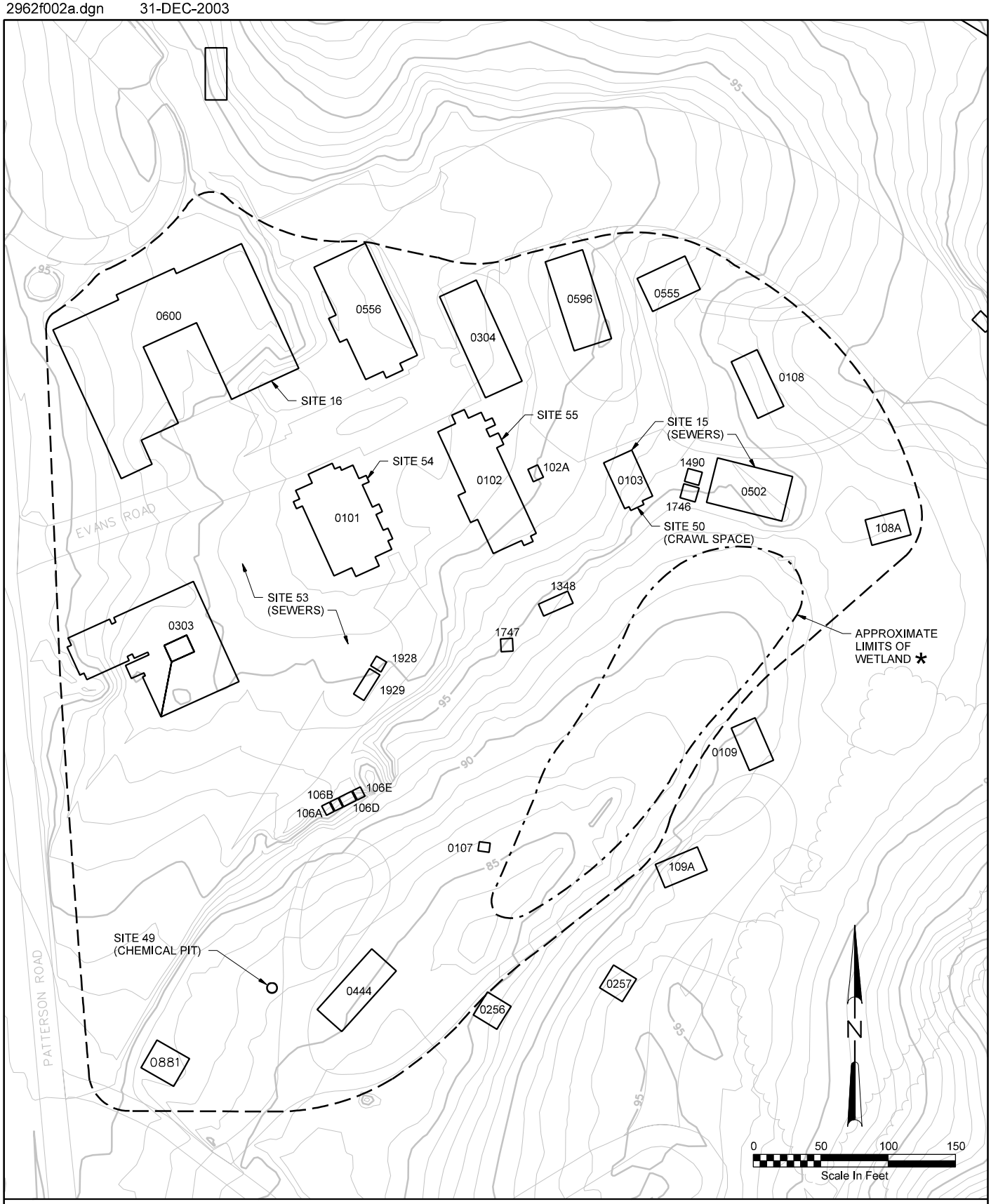

LEGEND

APPROXIMATE LIMITS OF EMERGENT WETLANDS

PROPOSED LIMITS OF "LAB AREA"

* ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

Figure 1-2
Limits of Lab Area
Lab Area RI
NDWIH
Indian Head, Maryland

CH2MHILL

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Figure 1-3
Location of Lab Area
Lab Area RI
NDWIH
Indian Head, Maryland

CH2MHILL

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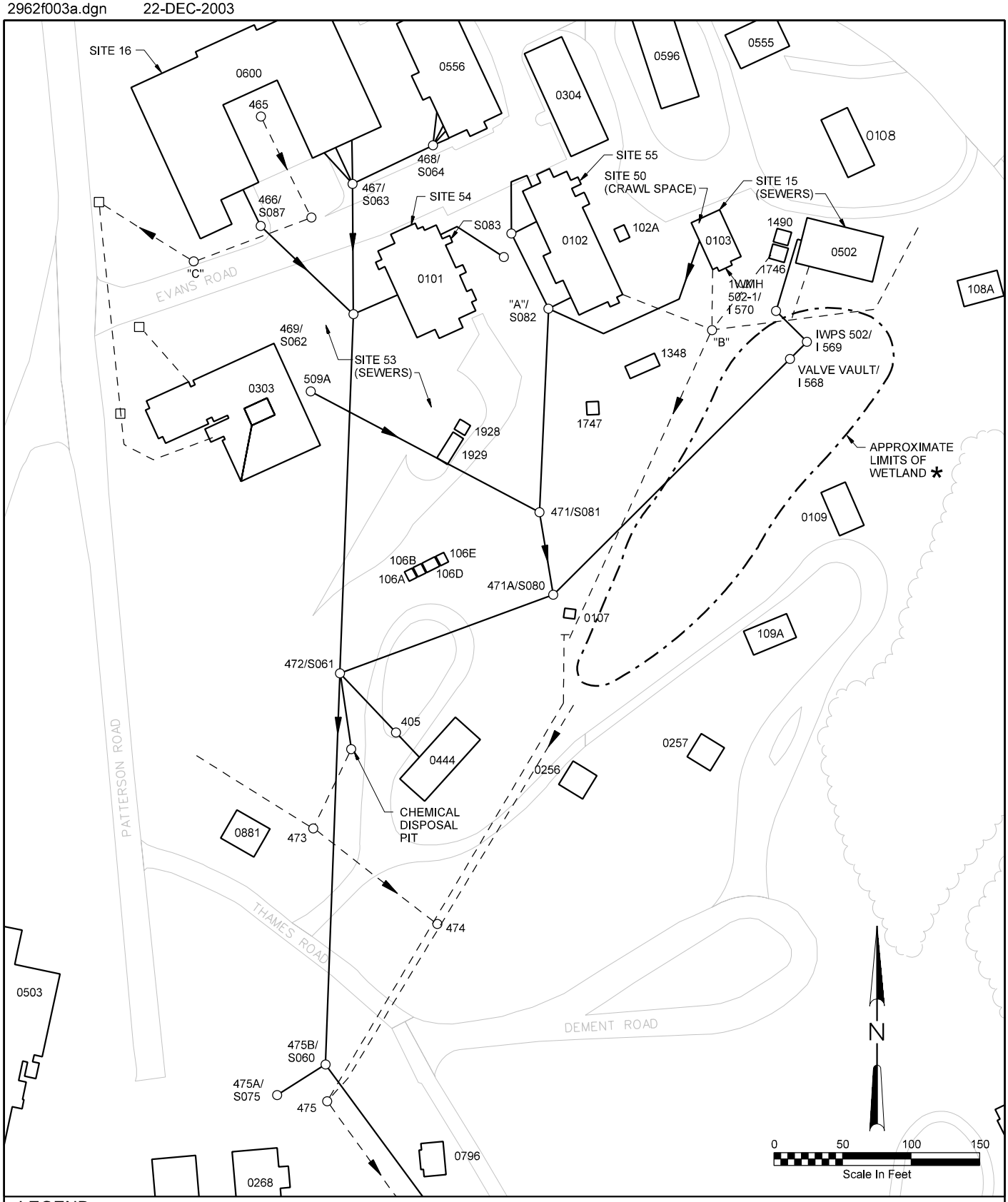

LEGEND

- ○ MANHOLE
- □ GRATE
- – – – – STORM SEWER
- ——— SANITARY SEWER
- - — - — APPROXIMATE LIMIT OF EMERGENT WETLANDS
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION. AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

1. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
2. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
3. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

Figure 1-4
LAB AREA SEWERS
AND MANHOLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

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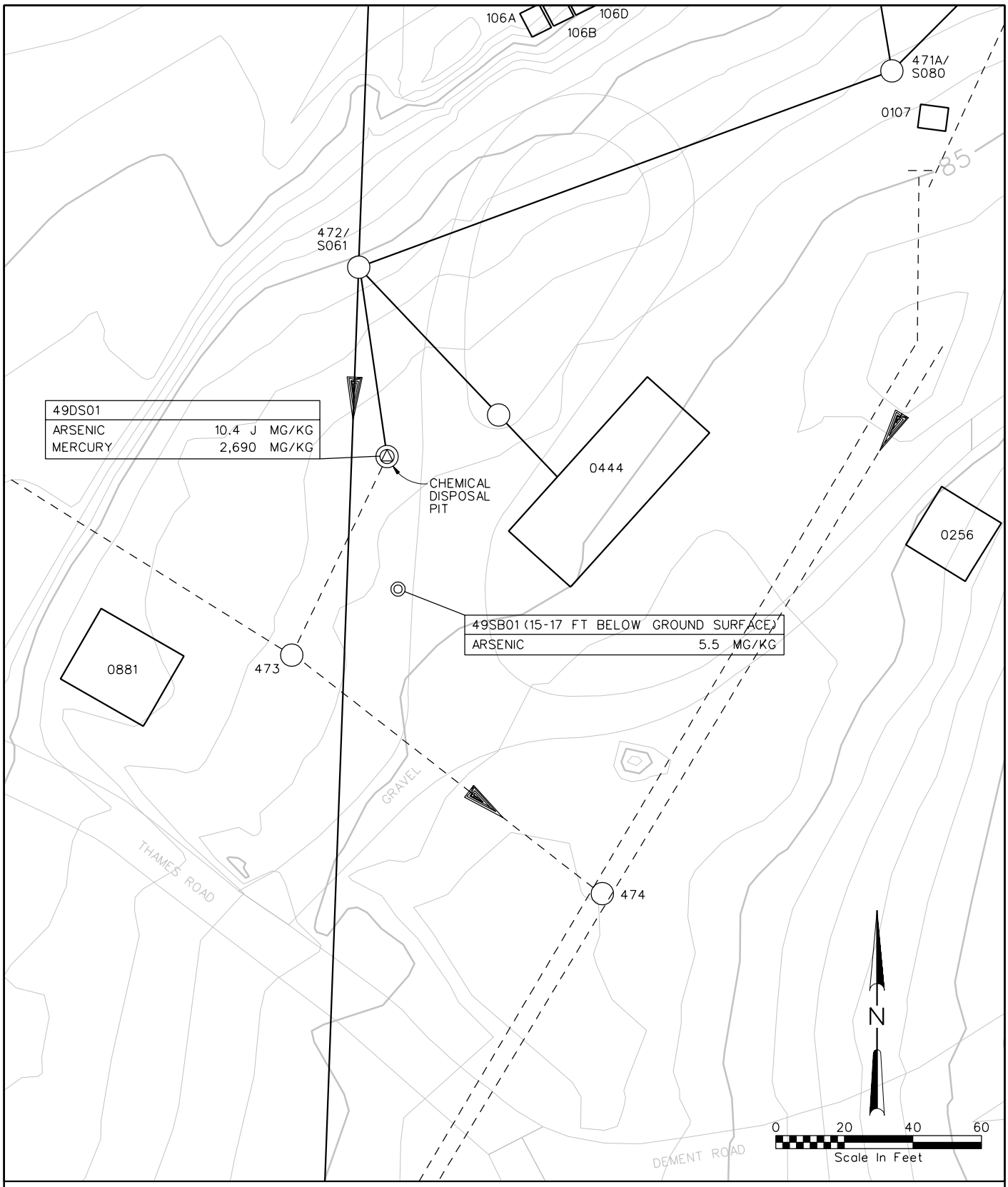

LEGEND

- ◎ SOIL BORING SAMPLE LOCATION
- △ SEDIMENT SAMPLE LOCATION
- ○ MANHOLE
- ? EXISTENCE OF SEWER LINE NOT CONFIRMED
- – – – – STORM SEWER
- ——— SANITARY SEWER

NOTES:

1. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
2. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

Figure 1-5
SITE 49 - LOCATIONS OF SOIL BORING AND SEDIMENT SAMPLE AND USEPA REGION III RBC EXCEEDANCES ADAPTED FROM E/A&H SI (1994)
LAB AREA RI

NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

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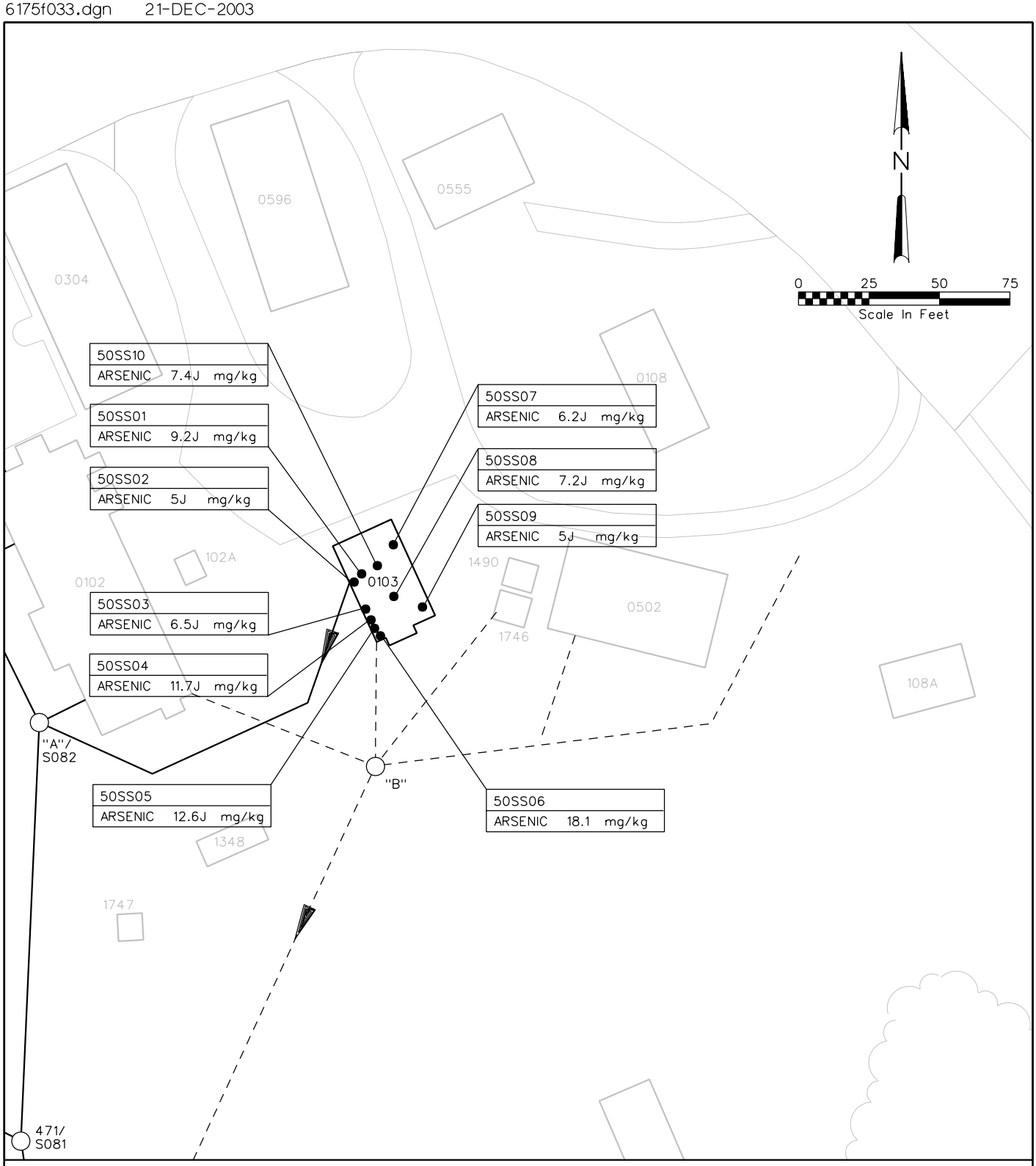

LEGEND

- - - - - STORM SEWER

——— SANITARY SEWER

○ MANHOLE

● SURFACE SOIL SAMPLE

NOTES:

1. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN THE PAST INVESTIGATIONS.
2. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 15. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
3. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

Figure 1-6
SITE 50 -
LOCATIONS OF CRAWL SPACE
SURFACE SOIL SAMPLES
AND USEPA REGION III EXCEEDANCES
ADAPTED FROM E/A&H SI (1994)
LAB AREA RI

NDWIH

IAN HEAD, MARYLAND

CH2MHILL

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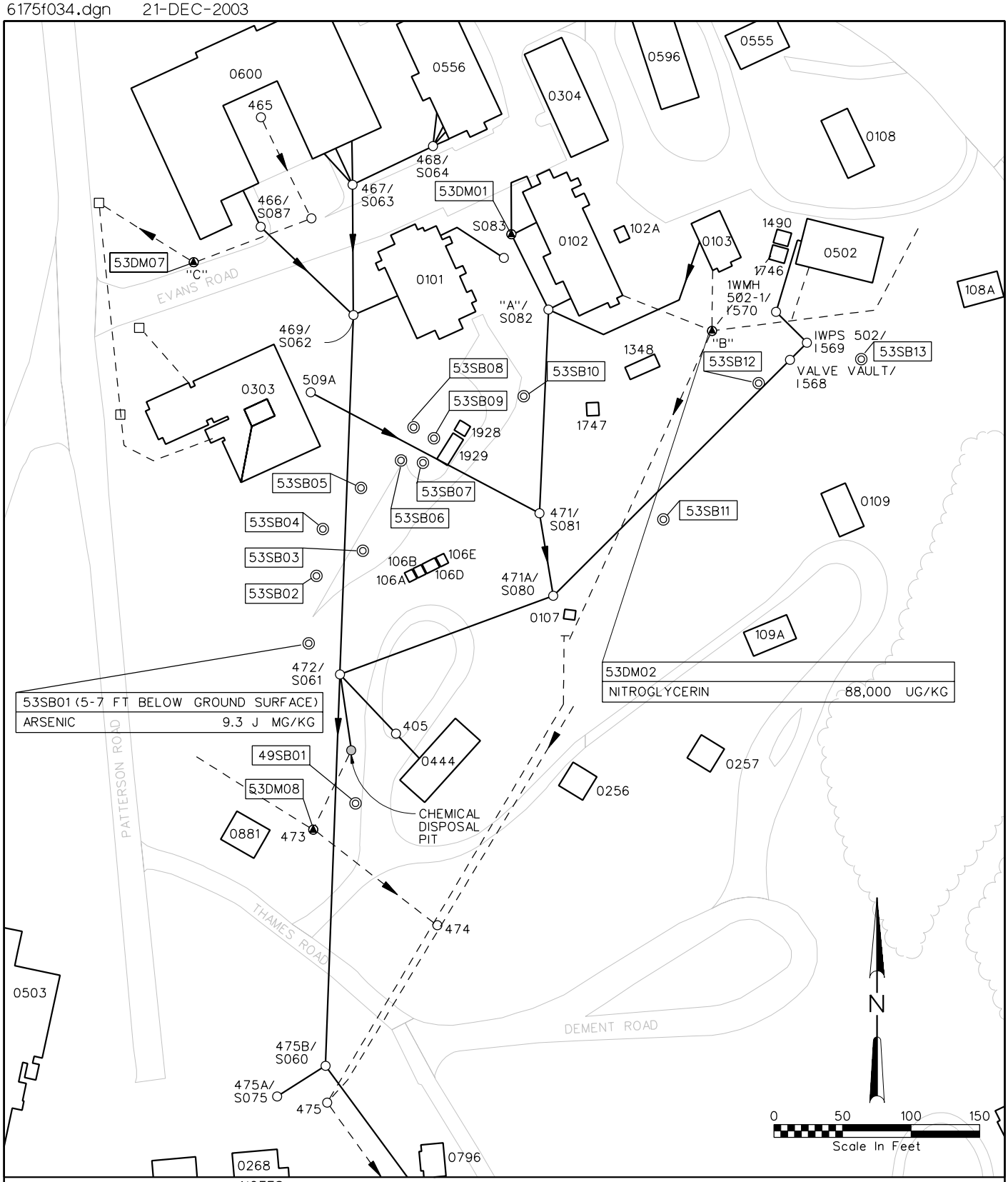

LEGEND

- SEDIMENT SAMPLE LOCATION
- SOIL BORING SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER

NOTES:

1. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
2. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
3. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
4. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

Figure 1-7
SITE 53 -
LOCATIONS OF SOIL BORING AND SEDIMENT SAMPLES AND USEPA REGION III RBC EXCEEDANCES FROM E/A&H SI (1994)
LAB AREA RI

NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

SECTION 2

Remedial Investigation Activities

This section describes the scope and rationale for the field activities that were conducted during the RI at the Lab Area, NDWIH. The field activities associated with the surface soil, sediment, and surface water sampling; the direct push technology (DPT) subsurface soil sampling activity; and the Chemical Disposal Pit removal activity were conducted between April 30 and May 16, 2001. The work included sampling surface soil, subsurface soil, sewer sediment, wetlands sediment, and wetlands surface water, as well as collecting confirmatory soil samples while removing the Chemical Disposal Pit. The activities are described under sections specific to each type of environmental media investigated.

Table 2-1 identifies the various sampling parameters and analytical test methods used during the field investigation. Table 2-2 lists the constituents and analytes for each test method and the associated contract-required or typical detection limits for these analyses. Actual detection limits will vary for soil and sediment samples due to corrections for moisture content, and will vary for some water samples due to dilutions and interferences. Actual detection limits for each sample and constituent may be found in the raw data tables in Appendix E.

2.1 Field Activities

Fieldwork for the Lab Area RI began on April 30, 2001, and concluded on May 25, 2001. The field investigation included surface soil sampling, subsurface pipe bedding soil sampling, sewer sediment sampling, wetlands surface water and sediment sampling, removing the Chemical Disposal Pit, and obtaining location coordinates with a global positioning system (GPS) unit. Disposal of the Chemical Disposal Pit rubble [i.e., investigation-derived waste (IDW)] occurred on August 10, 2001. Disposal of other IDW from the Lab Area RI field investigation [i.e., soil, decontamination fluids, and personal protective equipment (PPE)] occurred on August 21, 2001.

In most instances, where analytical samples were collected, a full suite of analyses was performed. The full suite was comprised of Target Compound List (TCL) VOCs and SVOCs, Target Analyte List (TAL) inorganics (i.e., metals and cyanide), and explosives [which also included nitroglycerin (NG), nitroguanadine (NQ), pentaerythritol tetranitrate (PETN), and perchlorate, in addition to the list of analytes included in USEPA SW-846 Method 8330]. It is noted in the respective sections where analyses differ from those shown above. Sampling parameters for all samples collected are shown in Table 2-1.

For all media, if analysis for VOCs was required, VOC samples were collected first followed by the remaining analyses in any order except as noted.

Health and safety procedures included daily health and safety meetings, modified level D attire, and continual air monitoring during DPT and sewer sampling activities. No elevated breathing zone readings were encountered during the RI field activities.

2.1.1 Sample Nomenclature

All samples collected during the RI field effort were assigned sample identification numbers (IDs). Each sample ID begins with "IS53" or "IS49." Samples with "IS53" are the conglomerate of samples from Sites 15, 16, 50, 53, 54, and 55, since Site 53 encompasses all or portions of the these sites (Figure 1-2). Samples with "IS49" are from the area generally around the Chemical Disposal Pit at Site 49 (Figure 1-2).

Each sample ID also has a media type indicator: "SS" for surface soil, "SB" for subsurface soil, "SD" for sediment, and "SW" for surface water.

Surface soil samples collected during the RI field effort were assigned sample IDs based on their sample locations. The locations of each sample were assigned station IDs during the planning phase of the RI. The sample IDs of the surface soil samples are the same as the station IDs, except that the sample IDs include "0001" at the end. This signifies a sample depth of zero (00) ft-bgs to one (01) ft-bgs, although surface soil samples were actually collected down to a depth of 6 inches. For example, the soil sample IS53SS010001 is a surface soil sample collected at location, or station, IS53SS01, and collected between 0 ft-bgs to 1 ft-bgs (or 6 inches below ground surface).

Subsurface soil samples collected during the RI field effort were also assigned sample IDs based on their sample locations. The locations where the samples were collected were arbitrarily assigned station IDs during the planning phase of the RI. The sample IDs of the subsurface soil samples are the same as the station IDs except that the sample IDs also have a four digit number added to the end to signify each sample depth interval. For example, the subsurface soil sample IS53SB010608 is a subsurface soil sample collected at location, or station, IS53SS01, and collected from a depth between 6 ft-bgs and 8 ft-bgs.

Sewer sediment samples collected during the RI field effort were assigned sample IDs based on their sample locations. The stations where each sewer sediment sample was collected at were assigned IDs during the planning phase of the RI, based on a downstream to upstream order of the thirteen manholes that were to be sampled (refer to Figure 1-4). For example, the sewer sediment sample IS53SD01 was collected from Manhole 474, since Manhole 474 is the most downstream manhole of those that were anticipated to be sampled.

Wetland sediment sample IDs were also associated with each wetland sediment sample location, or station. The locations were arbitrarily assigned IDs during the planning phase of the RI.

The anticipated wetland surface water samples collected during the RI field effort were also assigned sample IDs based on their sample locations, which were arbitrarily assigned station IDs during the planning phase of the RI.

For simplicity, in the following sections and figures, samples and stations will be referred to synonymously by using abbreviated sample IDs. For example, IS53SS01will refer to surface soil sample IS53SS010001, and IS53SB01 will refer to subsurface soil sample IS53SBSB010608, truncating the sample depth interval.

2.1.2 Surface Soil Sampling

The only surface soil samples previously collected as part of the 1992 SI in the Lab Area were located in the crawl space of Building 103 (Site 50). These were collected near the known sink drain outlets and drainage features beneath the building, but no samples were previously taken on the ground surface outside of the building. The detection of contamination within the crawl space and the nature of the drainage paths under and outside of Building 103 warranted the sampling of the surface soil around the building.

Previous sampling at Buildings 101 and 102 was limited to the structures themselves; however, it is outside the scope of the IR program to remediate structures. Therefore, sampling in the Lab Area focused on these and other buildings as sources of contamination in the surface soil.

For this RI, 84 surface soil samples were collected in the Lab Area and submitted for analysis by a contract laboratory (refer to Table 2-1). Seventy of the surface soil samples (i.e., IS53SS01 through IS53SS64 and IS53SS71 through IS53SS76) were collected from areas adjacent to each of the buildings in the Lab Area (refer to Figure 2-1). These samples were biased to locations of doorways, drain outlets, and topographic drainage features where contaminants may have been disposed of, drained into, or accumulated. Six surface soil samples (i.e., IS53SS65 through IS53SS70) were collected in the general area between the southern boundary of the buildings and the northern edge of the wetlands area (refer to Figure 2-1). Four samples, IS53SD16 through IS53SD19, were anticipated to be sediment samples in the wetlands area, but were dry during the field activity (refer to Figure 2-1). Due to the absence of surface water above the soil (and the absence of moisture in the soil), the "sediment" samples were treated as surface soil samples for comparison and risk assessment (also refer to Section 2.1.4.2). For this RI Report, these four sediment samples that will be treated as surface soil samples for comparison, and will be referred to as the "dry sediment samples." Additionally, two surface soil samples (i.e., IS49SS01 and IS49SS02) were confirmatory soil samples associated with the Chemical Disposal Pit removal activity at Site 49 (refer to Figure 2-2), but are grouped with the rest of the soil samples for discussion. Finally, two surface soil samples (i.e., IS53SS77 and IS53SS78) were collected in the forested area, uphill from Buildings 109 and 109A, to be used as site-specific background samples (refer to Figure 2-1).

The surface soil [and dry sediment] samples were collected from a depth of 0 inches to 6 inches using decontaminated stainless steel trowels and bowls to transfer the soil to the sampling containers. Table 2-1 shows the sampling analyses for these surface soil samples, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses.

All surface soil samples were analyzed for TAL inorganics and explosives (including PETN, NG, NC, and NQ) by a contract laboratory (refer to Table 2-1). Nineteen samples (i.e., about 20 percent), including the confirmatory surface soil samples at Site 49, were also analyzed for TCL VOCs and TCL SVOCs. One of the dry sediment samples (i.e., IS53SD18) was also analyzed for TCL SVOCs. Ten surface soil samples were selected for analysis of TOC and pH. The 10 samples were spread throughout the site, covering all the major soil types. All four of the dry sediment samples were also analyzed for TOC and pH. One of the dry sediment samples (i.e., IS53SD18) was also analyzed for grain size.

The appropriate number of field quality assurance/quality control (QA/QC) samples, including field blanks, rinsate blanks, matrix spike and matrix spike duplicate samples (MS/MSDs), and duplicates, were analyzed in addition to laboratory QA/QC samples. Analyses of the soil samples were performed in accordance with Navy Level D guidance.

2.1.3 Subsurface Soil and Sewer Sediment Sampling

Past efforts and investigations in the Lab Area sewers and storm drains indicated that the gross mercury contamination had been removed from the sewer system, the depth to groundwater exceeded 30 feet to 40 feet, and the soil conditions at the site would inhibit the migration of contamination. What the past investigations did not clearly establish was the extent of the subsurface contamination adjacent to the damaged pipe sections, the complete extent of manhole sediment contamination, and the extent of contamination downstream of the site (i.e., where the storm drain system discharges to the Mattawoman Creek). The scope of this investigation was developed to address these first two of these data gaps.

A reconnaissance of the storm drain system found that the Lab Area storm drain system discharges directly to the Mattawoman Creek. The 2002 Mattawoman Creek Study, performed by TetraTech NUS, Inc. (TTNUS), addressed contamination of Mattawoman Creek. Therefore, no sampling of the discharge was proposed under this RI.

2.1.3.1 Subsurface Soil

Field activities during the E/A&H SI (1994) included sampling subsurface soil for a variety of contaminants at 13 locations within Site 53. The goal of the SI was to collect soil samples near sections of sanitary sewer lines that the video surveying indicated to be damaged sufficiently (i.e., that contaminants might leak from and contaminate the surrounding soil). A comparison of the available results of the 1988 video survey (refer to Appendix A) and analytical results from the SI (refer to Section 1.4.5, Tables 1-6 and 1-7, and Figure 1-7) demonstrated no correlation between damaged sections of sanitary sewer pipe and detections of mercury.

Given the low mobility of mercury and nitrate esters (i.e., explosives) in the environment, it is unlikely that contaminants (that may have leaked from the lines) would have migrated far from the lines. In addition, they likely would have migrated either downward toward the water table or laterally along any existing bedding surrounding the sewer lines.

Part of the difficulty in sampling subsurface soil near the sewers for the E/A&H SI may have included sampling close to the sewers with cumbersome drilling techniques. During this RI, CH2M HILL used DPT, decreasing the risk of breaking into a sewer, as compared to using a hollow-stem auger or similar heavy-duty equipment.

DPT soil borings were proposed at locations identified as likely locations for the accumulation of mercury (that would have leaked from the sewer lines). These locations were limited to the sewer lines that were closest to the buildings within the Lab Area. Although nearly all of the sewer lines contain cracks and potential integrity breaches, it was assumed that most of the mercury would have leaked out of the lines that are closest to the sources (i.e., the buildings).

Additionally, sample locations were biased near manholes. It was assumed that mercury (that would have leaked out of a sewer line) would migrate down-slope along potential pipe

bedding and accumulate at the lowest point of the sewer pipe run, adjacent to a manhole structure. Due to the nature of the in-situ soils, it was assumed that the mercury would not be able to permeate down into the water table, but would follow the more permeable pipe bedding. By locating samples near the manholes, more accurate sample collection locations were determined: the number of pipes present in the manhole structure could be viewed, pipe depths below ground surface could be determined, and the orientation of each pipe could be determined.

During this RI, 28 subsurface soil samples (i.e., IS49SB01 through IS49SB03, IS49SB05, IS49SB06, IS53SB01 through IS53SB04, and IS53SB06 through IS53SB24) were collected and submitted for analysis by a contract laboratory (refer to Figures 2-2 and 2-3). Twenty-nine samples were anticipated, but because of refusal at one location, sample IS53SB05 was not collected (with consensus from EFACHES and MDE). Note that IS49SB01 was also the confirmatory subsurface soil sample for the Chemical Disposal Pit removal. IS49SB01 was collected directly from the excavation bucket during the pit excavation, while the rest of the subsurface soil samples were collected with a macrocore Teflon tube sampler using a DPT rig.

Table 2-1 shows the sampling analyses for these subsurface soil samples, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses. All of the subsurface soil samples were analyzed for TAL inorganics. The wide variety of chemicals used in the buildings served by the sewer lines suggested that an estimated five samples of the Site 53 conglomerate also should be analyzed for TCL VOCs, TCL SVOCs, and explosives (including PETN and the nitrate esters, NG, NC, and NQ). Similarly, the subsurface soil samples at Site 49 were also analyzed for TCL VOCs, TCL SVOCs, and explosives (including PETN and the nitrate esters, NG, NC, and NQ).

The appropriate number of field QA/QC samples, including field blanks, rinsate blanks, MS/MSDs, and duplicates, were analyzed in addition to laboratory QA/QC samples. Analyses of the soil samples were performed in accordance with Navy Level D guidance.

2.1.3.2 Sewer and Storm Drain Sediment

The E/A&H SI (1994) reported that 13 manholes in the Lab Area were planned for sampling, but only four manholes contained sufficient sediment for the required analyses (refer to Section 1.4.5). Another attempt was made to collect sediment samples from the remaining nine manholes, and to resample those sampled as part of the SI to evaluate the changes in sediment quality over time. It was believed that the installation of pipe linings in several of the sanitary sewers may have forced sediments into the manholes, providing an adequate amount of sediment for sample collection. The pipe linings were installed between 1988 and 1998, according to the video pipe condition survey conducted by RJN Group in 1988, as well as the Infiltration and Inflow Investigation for the Wastewater Collection System in the Lab Area conducted by RJN Group in 1998 (refer to Appendix A).

During this RI, most manhole locations were evident from records and completely visible; however, Manhole 466 was located with historical records and a shovel. Fourteen sediment samples were anticipated, but insufficient sediment volume prevented sample collection from Manholes MH475B, MH472, MH469, MH468, MH467, and MH465. Subsequently, eight sewer sediment samples (i.e., IS53SD01, IS53SD02, IS53SD04 through IS53SD07, IS53SD09, and IS53SD10) were collected and submitted for analysis by a contract laboratory

(refer to Figure 2-3). The samples were collected by scooping the bottom of the manhole with a disposable dipper attached to a rod. A new dipper was used at each manhole. Areas of the manhole bottom where sediment tends to accumulate were targeted for sampling. The sediment was then transferred to the sampling containers.

Table 2-1 presents the sampling analyses for these sediment samples and the manholes that the sediment samples were collected from, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses. All sewer sediment samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, perchlorate, and explosives (including PETN, NG, NC, and NQ).

The appropriate number of field QA/QC samples, including field blanks, rinsate blanks, MS/MSDs, and duplicates, were analyzed in addition to laboratory QA/QC samples. Analyses of the sediment samples were performed in accordance with Navy Level D guidance.

2.1.4 Emergent Wetlands Surface Water and Sediment Sampling

No chemical data were collected from the emergent wetland during previous investigations at the Lab Area.

2.1.4.1 Emergent Wetlands Surface Water Sampling

For this RI, three surface water samples were anticipated in the emergent wetland; however, the water level in the channel was very low, allowing for the collection of one surface water sample (i.e., IS53SW01), only (refer to Figure 2-1). The surface water sample was collected by submerging the sample containers under the water in the channel.

Table 2-1 shows the sampling analyses for this surface water sample, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses. The surface water sample was analyzed for TCL SVOCs, TAL inorganics, explosives (PETN, NG, NC, and NQ), perchlorate, and hardness by a contract laboratory.

Only a field duplicate and field blank were collected and analyzed in addition to laboratory QA/QC samples. Analysis of the surface water sample was performed in accordance with Navy Level D guidance.

2.1.4.2 Emergent Wetlands Sediment Sampling

For this RI, collection of six sediment samples from the emergent wetlands area to the southeast of the Lab Area were anticipated (refer to Figure 2-1); however, only two samples (i.e., IS53SD14 and IS53SD15) were actual sediment samples, lying in a channel under water. The remaining samples (i.e., IS53SD16 through IS53SD19) were classified by media as surface soil samples, despite their sample IDs, since they were outside of the channel in a dry soil. It is possible that the area outside the channel had deposition sediment, since it is within the emergent wetland are; however, the locations and lack of moisture in the soil called for a surface soil classification. Samples IS53SD14 through IS53SD19, the dry sediment samples, were collected using decontaminated stainless steel trowels and bowls to transfer the sediment and/or surface soil to the sampling containers.

Table 2-1 presents the sampling analyses for these sediment samples, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses. The samples were analyzed for TAL inorganics, explosives (including PETN, NG, NC, and NQ), perchlorate, TOC, and pH by a contract laboratory. Two samples, one collected within the channel and one outside of the channel, were analyzed for TCL SVOCs and grain size.

The appropriate number of field QA/QC samples, including field blanks, rinsate blanks, MS/MSDs, and duplicates, were analyzed in addition to laboratory QA/QC samples. Analyses of the soil and sediment samples were performed in accordance with Navy Level D guidance.

2.1.5 Chemical Disposal Pit Removal Activity at Site 49

The Chemical Disposal Pit at Site 49 was removed by Clean Harbors of Baltimore, Maryland, on May 15, 2001. Confirmatory soil samples were collected on the surface edges outside of the excavation (i.e., surface soil samples IS49SS01 and IS49SS02) and at the bottom of the excavation (i.e., subsurface soil sample IS49SB01) (refer to Figure 2-2).

The pit was excavated 1 foot around the Chemical Disposal Pit concrete cylinder, exposing the bricks thought to be part of the OWAP (i.e., Site 14; also refer to Sections 1.4.3 and 1.4.9) and the two vitrified clay sewer drainage pipes connecting the Chemical Disposal Pit to Manholes 473 and 472. The concrete cylinder was removed by hoisting it out with a backhoe and placing it into a rolloff container with the excavated soil. The vitrified clay pipes were broken when the concrete cylinder was hoisted out. They were abandoned by filling the ends with concrete. The end of the pipe that day-lighted into Manhole 472 could not be filled because of safety and access issues, per consensus from onsite EFACHES, MDE, and NDWIH personnel. The manhole was scheduled for refurbishment by another contractor, allowing the pipe to be abandoned later.

Attempting to excavate 1 foot below the Chemical Disposal Pit (i.e., the concrete cylinder) exposed a flat slab of concrete that appeared to be the abandoned OWAP, approximately 8 inches below the bottom of the Chemical Disposal Pit (i.e., approximately 5 ft-bgs). An interview by NDWIH personnel with a retired Lab Area worker of 40 years (Baroody, 2001) revealed that, after digging out and filling the OWAP with concrete in the early 1970s, the Chemical Disposal Pit was installed on top of the abandoned OWAP. Additionally, excavating around the Chemical Disposal Pit (which revealed the apparent brick side walls of the OWAP) exposed the concrete footers of the fence posts that reportedly surrounded the OWAP, as described in the IAS (NEESA, 1983) and the PA (NEESA, 1992). Due to the co-location of these pits, data collected associated with the Chemical Disposal Pit were also considered representative of the OWAP, and results of this RI were considered sufficient to also document closure of the OWAP.

After placing a geofabric marking layer, the excavated area (i.e., down to the concrete of the abandoned OWAP) was filled with certified clean fill, compacted and graded to drain, and re-seeded with native grass by Clean Harbors.

The two surface soil confirmatory samples were also used for comparison and risk assessment in the Lab Area. The samples were collected just outside of the excavation area from a depth of 0 inches to 6 inches, using decontaminated stainless steel trowels and bowls

to transfer the soil to the sampling containers. The confirmatory subsurface soil sample was collected from the soil just above the concrete vault-like cover to the OWAP, approximately 5 ft-bgs. Table 2-1 shows the sampling analyses for these confirmatory soil samples, while Table 2-3 summarizes the bottle ware, preservation, and holding time requirements for the different sample analyses.

The subsurface confirmatory soil sample and the two surface soil confirmatory samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, and explosives (including PETN, NG, NC, and NQ) by a contract laboratory.

The appropriate number of field QA/QC samples, including field blank, rinsate blank, MS/MSD, and duplicate were analyzed for the surface soil samples in addition to laboratory QA/QC samples. No QA/QC samples were collected for the confirmatory subsurface soil sample. Analyses of the samples were performed in accordance with Navy Level D guidance.

2.1.6 GPS

All of the sampling locations at the Lab Area were located using a Global Position System (GPS) unit in May 2001. The GPS unit (i.e., the Trimble™ Pathfinder GPS Pro XRS) provided an accuracy of less than one meter. The x,y-coordinates are included in the Navy's CLEAN II IR database.

2.1.7 Investigation-Derived Waste Handling

IDW was generated during several of the field activities conducted during the RI. IDW was managed as follows:

1. Soil cores generated during DPT subsurface soil sampling.

   Disposition: Soil left over from a DPT macrocore grab was placed into a 55-gallon drum during sampling, then transported to the designated staging area at NDWIH IR Site 47. Following receipt of analytical results, the soil was disposed of as non-hazardous (and not listed) waste by Clean Harbors of Baltimore, Maryland.

2. Decontamination rinsate generated during decontamination of down-hole DPT equipment and stainless steel sampling trowels and bowls.

   Disposition: Decontamination rinsate was transferred from buckets into a 55-gallon drum, and then transported to the designated staging area at Site 47. Following receipt of analytical results, rinsate was removed as non-hazardous (and not listed) waste by Clean Harbors of Baltimore, Maryland.

3. Concrete rubble, metal fragments, vitrified clay fragments, and excavated soil resulting from the Chemical Disposal Pit removal activity.

   Disposition: Concrete rubble, metal fragments, vitrified clay fragments, and excavated soil were transferred to, and stored in, a roll-off container that remained on-site. The rubble and soil were sampled by Clean Harbors and analyzed for disposal. Following

receipt of analytical results, the contents of the roll-off container were removed as non-hazardous (and not listed) waste by Clean Harbors, located in Baltimore, Maryland.

4. PPE used during all phases of the investigation, and expendables used during sampling such as tubing and disposable sampling equipment.

   Disposition: PPE was discarded in facility dumpsters because sample results indicated that soil and rinsate water were non-hazardous.

2.2 References

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Table 2-1
Summary of Sampling Program
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media	Sample ID Number	Sample Depth/Location	Analysis								
			TCL VOCs	TCL SVOCs	TAL Inorganics	Explosives	Ammonium Perchlorate	TOC	pH	Hardness	Grain Size
Surface Soil	IS49SS010001 *	0-6" deep outside area of pit removal	X	X	X	X					
	IS49SS020001 *	0-6" deep outside area of pit removal	X	X	X	X					
	IS53SS010001	Building 103: outside door on north side	X	X	X	X		X	X		
	IS53SS020001	Building 103: off southeast corner			X	X					
	IS53SS030001	Building 103: outside door on south side			X	X					
	IS53SS040001	Building 103: off southweast corner			X	X					
	IS53SS050001	Building 502: outside doors on west side	X	X	X	X					
	IS53SS060001	Building 502: off northeast corner			X	X					
	IS53SS070001	Building 502: outside doors on east side			X	X					
	IS53SS080001	Building 502: off south side			X	X					
	IS53SS090001	Building 502: off south side in wet area			X	X					
	IS53SS100001	Building 108: outside door on west side	X	X	X	X		X	X		
	IS53SS110001	Building 108: off northeast corner			X	X					
	IS53SS120001	Building 108: between crawl space doors on east side			X	X					
	IS53SS130001	Building 108: off southeast corner			X	X					
	IS53SS140001	Building 108A: outside door on north side	X	X	X	X					
	IS53SS150001	Building 108A: at 4" cast iron pipe outlet on south side			X	X					
	IS53SS160001	Building 555: outside door on north side	X	X	X	X		X	X		
	IS53SS170001	Building 555: outside door on west side			X	X					
	IS53SS180001	Building 555: outside door on south side			X	X					
	IS53SS190001	Building 555: outside door on east side			X	X					
	IS53SS200001	Building 596: outside door on north side	X	X	X	X					
	IS53SS210001	Building 596: off southweast corner			X	X					
	IS53SS220001	Building 596: outside door on south side			X	X					
	IS53SS230001	Building 596: off southeast corner by drain outlet			X	X					
	IS53SS240001	Building 304: outside door on north side	X	X	X	X		X	X		
	IS53SS250001	Building 304: off southweast side			X	X					
	IS53SS260001	Building 304: off southweast side of patio			X	X					
	IS53SS270001	Building 304: off southeast side			X	X					
	IS53SS280001	Building 102: outside door on north side	X	X	X	X					
	IS53SS290001	Building 102: outside door on northeast corner			X	X					
	IS53SS300001	Building 102: off southeast side by A/C equip.			X	X					
	IS53SS310001	Building 102: off southeast corner			X	X					
	IS53SS320001	Building 102: outside door on south side			X	X					
	IS53SS330001	Building 102: off southweast corner			X	X					
	IS53SS340001	Building 102: off west side between door and drain outlets			X	X					
	IS53SS350001	Building 1348: off south side	X	X	X	X		X	X		
	IS53SS360001	Building 101: outside door on northeast corner	X	X	X	X					
	IS53SS370001	Building 101: outside door on southeast corner			X	X					
	IS53SS380001	Building 101: off west side			X	X					
	IS53SS390001	Building 556: outside door on north side	X	X	X	X		X	X		
	IS53SS400001	Building 556: off northwest side by drain outlet			X	X					
	IS53SS410001	Building 556: outside door on south side			X	X					
	IS53SS420001	Building 556: off southeast corner in drainage swale			X	X					
	IS53SS430001	Building 556: at drain outlet across street to the north			X	X					
	IS53SS440001	Building 600: outside door on north side	X	X	X	X					
	IS53SS450001	Building 600: outside door on north side			X	X					
	IS53SS460001	Building 600: in drainage swale on east side			X	X					
	IS53SS470001	Building 600: in drainage swale on east side			X	X					
	IS53SS480001	Building 600: outside door on south side			X	X					
	IS53SS490001	Building 600: outside door off concrete	X	X	X	X		X	X		
	IS53SS500001	Building 600: next to stairwell in grass			X	X					
	IS53SS510001	Building 600: outside door on south side			X	X					
	IS53SS520001	Building 600: off southweast side			X	X					
	IS53SS530001	Building 600: off northwest side			X	X					
	IS53SS540001	Building 600: in pond sediment			X	X					
	IS53SS550001	Building 600: in storm sewer grate sediment			X	X					
	IS53SS560001	Building 303: between door and drain outlet on east side	X	X	X	X					
	IS53SS570001	Building 303: off south side			X	X					
	IS53SS580001	Building 303: off west side			X	X					
	IS53SS590001	Building 303: in storm sewer grate sediment			X	X					
	IS53SS600001	Building 303: off northeast side			X	X					
	IS53SS610001	Building 444: outside door on northwest side	X	X	X	X					
	IS53SS620001	Building 444: near drain outlets on northeast side			X	X		X	X		
	IS53SS630001	Building 444: outside door on southeast side			X	X					
	IS53SS640001	Building 444: outside door on southeast side			X	X					
	IS53SS650001	Between Lab Area Buildings and Wetland	X	X	X	X					
	IS53SS660001	Between Lab Area Buildings and Wetland			X	X					
	IS53SS670001	Between Lab Area Buildings and Wetland			X	X					
	IS53SS680001	Between Lab Area Buildings and Wetland			X	X					
	IS53SS690001	Between Lab Area Buildings and Wetland			X	X					
	IS53SS700001	Between Lab Area Buildings and Wetland			X	X					
	IS53SS710001	Located at field team's discretion	X	X	X	X		X	X		
	IS53SS720001	Located at field team's discretion			X	X					
	IS53SS730001	Located at field team's discretion			X	X					
	IS53SS740001	Located at field team's discretion			X	X					
	IS53SS750001	Located at field team's discretion			X	X					
	IS53SS760001	Located at field team's discretion			X	X					
	IS53SS770001	Background sample			X	X					
	IS53SS780001	Background sample			X	X		X	X		
	IS53SD16 **	Wetland Area			X	X	X	X	X		
	IS53SD17 **	Wetland Area			X	X	X	X	X		
	IS53SD18 **	Wetland Area		X	X	X	X	X	X		X
	IS53SD19 **	Wetland Area			X	X	X	X	X		

Table 2-1
Summary of Sampling Program
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample Media	Sample ID Number	Sample Depth/Location	Analysis								
			TCL VOCs	TCL SVOCs	TAL Inorganics	Explosives	Ammonium Perchlorate	TOC	pH	Hardness	Grain Size
Subsurface Soil	IS49SB010405 *	0-6" deep in base of excavation pit	X	X	X	X					
	IS49SB020708	Adjacent to pipe and manhole outfall	X	X	X	X					
	IS49SB030607	Adjacent to pipe and manhole outfall	X	X	X	X					
	IS49SB050507	Adjacent to pipe and manhole outfall	X	X	X	X					
	IS49SB060507	Adjacent to pipe and manhole outfall	X	X	X	X					
	IS53SB010608	Upgradient of MH466			X						
	IS53SB020204	Upgradient of MH467			X						
	IS53SB031416	Upgradient of MH467			X						
	IS53SB041112	Upgradient of MH468			X						
	IS53SB061214	Upgradient of MH469			X						
	IS53SB071415	Upgradient of MH469			X						
	IS53SB081314	Upgradient of MH469			X						
	IS53SB090507	Upgradient of MH SO83			X						
	IS53SB100405	Upgradient of MH "A" (SO82)			X						
	IS53SB110406	Upgradient of MH "A" (SO82)			X						
	IS53SB120304	Upgradient of MH471 (SO81)			X						
	IS53SB130304	Upgradient of MH471 (SO81)	X	X	X	X					
	IS53SB140304	Upgradient of MH "B"	X	X	X	X					
	IS53SB150304	Upgradient of MH "B"	X	X	X	X					
	IS53SB160304	Upgradient of MH "B"	X	X	X	X					
	IS53SB170102	Upgradient of "dry well" east of Building 101	X	X	X	X					
	IS53SB180607	Pipe segment between MH466 & MH 469			X						
	IS53SB191214	Pipe segment between MH466 & MH 469			X						
	IS53SB200506	Pipe segment between SO83 & SO82			X						
	IS53SB210607	Pipe segment between SO83 & SO82			X						
	IS53SB220405	Pipe segment between SO82 & SO81			X						
	IS53SB230708	Pipe segment between SO82 & SO81			X						
	IS53SB240910	Pipe segment between SO82 & SO81			X						
Sewer Sediment	IS53SD01	MH474	X	X	X	X	X				
	IS53SD02	MH473	X	X	X	X	X				
	IS53SD04	MH471	X	X	X	X	X				
	IS53SD05	Manhole "A" (SO82)	X	X	X	X	X				
	IS53SD06	SO83	X	X	X	X	X				
	IS53SD07	Manhole "B"	X	X	X	X	X				
	IS53SD09	MH466	X	X	X	X	X				
	IS53SD10	Manhole "C"	X	X	X	X	X				
Wetland Sediment	IS53SD14	Wetland Area		X	X	X	X	X	X		X
	IS53SD15	Wetland Area			X	X	X	X	X		
Wetland Surface Water	IS53SW01	Wetland Area		X	X	X	X			X	

Notes and Abbreviations

* Confirmatory samples for Chemical Disposal Pit removal at Site 49 of the Lab Area
** Anticipated sediment samples were classified as surface soil samples due to lack of surface water and/or saturation.
6" = 6 inches
TCL VOCs= Target Compound List volatile organic compounds
TCL SVOCs= Target Compound List semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)
Explosives included nitroglycerin, nitrocellulose, nitroguanadine, and pentaerythrite tetranitrate (in addition to the list of analytes included in USEPA SW-846 Method 8330)
TOC = total organic carbon
Analytical methods for surface soil, subsurface soil, and sediments: TCL VOCs (OLM04.2), TCL SVOCs (OLM04.2), TAL Inorganics (ILM04), Cyanide (335.2), Explosives (8330), Nitrocellulose (USATHAMA), Ammonium Perchlorate (314), TOC (9060), pH (9045), and Grain Size (Sieve Analysis).
Analytical methods for blanks and/or surface water: TCL VOCs (OLM04.2), TCL SVOCs (OLM04.2), TAL Inorganics (ILM04), Cyanide (335.2), Explosives (8330), Nitrocellulose (USATHAMA), Ammonium Perchlorate (314), and Hardness (130.2).

Table 2-2
Analytical Parameters and Detection Limits
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

TCL VOC List and CRDLs					
Constituent	**Aqueous CRDL* (µg/l)**	**Solid CRDL (µg/kg)**	**Constituent**	**Aqueous CRDL* (µg/l)**	**Solid CRDL (µg/kg)**
Acetone	10	10	Trans - 1,2-Dichloroethene	10	10
Benzene	10	10	1,2-Dichloropropane	10	10
Bromodichloromethane	10	10	cis-1,3-Dichloropropene	10	10
Bromoform	10	10	trans-1,3-Dichloropropene	10	10
Bromomethane	10	10	Ethylbenzene	10	10
2-Butanone	10	10	2-Hexanone	10	10
Carbon disulfide	10	10	Isopropyl Benzene	10	10
Carbon tetrachloride	10	10	Methyl Acetate	10	10
Chlorobenzene	10	10	Methyl Cyclohexane	10	10
Chloroethane	10	10	Methylene chloride	10	10
Chloroform	10	10	4-Methyl-2-pentanone	10	10
Chloromethane	10	10	Styrene	10	10
Cyclohexane	10	10	Tert-Butyl Methyl Ether	10	10
1,2–Dibromo-3-chloropropane	10	10	1,1,2,2-Tetrachloroethane	10	10
1,2 – Dibromoethane	10	10	Tetrachloroethene	10	10
Dibromochloromethane	10	10	Toluene	10	10
Dichlorodifluoromethane	10	10	1,2,4 – Trichlorobenzene	10	10
1,2 – Dichlorobenzene	10	10	1,1,1-Trichloroethane	10	10
1,3 – Dichlorobenzene	10	10	1,1,2-Trichloroethane	10	10
1,4 – Dichlorobenzene	10	10	Trichloroethene	10	10
1,1-Dichloroethane	10	10	Trichlorofluoromethane	10	10
1,2-Dichloroethane	10	10	1,1,2–Trichlor–1,2,2–trifluoroethane	10	10
1,1-Dichloroethene	10	10	Vinyl chloride	10	10
Cis - 1,2-Dichloroethene	10	10	Xylenes (total)	10	10

TCL SVOC List and CRDLs					
Constituent	**Aqueous CRDL* (µg/l)**	**Solid CRDL (µg/kg)**	**Constituent**	**Aqueous CRDL* (µg/l)**	**Solid CRDL (µg/kg)**
Acenaphthene	10	330	Dimethyl phthalate	10	330
Acenaphthylene	10	330	4,6-Dinitro-2-methylphenol	25	830
Acetophenone	10	330	2,4-Dinitrophenol	25	830
Anthracene	10	330	2,4-Dinitrotoluene	10	330
Atrazine	10	330	2,6-Dinitrotoluene	10	330
Benzaldehyde	10	330	Fluoranthene	10	330
Benzo(a)anthracene	10	330	Fluorene	10	330
Benzo(b)fluoranthene	10	330	Hexachlorobenzene	10	330
Benzo(k)fluoranthene	10	330	Hexachlorobutadiene	10	330
Benzo(g,h,i)perylene	10	330	Hexachlorocyclopentadiene	10	330
Benzo(a)pyrene	10	330	Hexachloroethane	10	330
1,1'- Biphenyl	10	330	Indeno(1,2,3-cd)pyrene	10	330
Bis(2-Chloroethoxy)methane	10	330	Isophorone	10	330
Bis(2-Chloroethyl)ether	10	330	2-Methylnaphthalene	10	330
Bis(2-Ethylhexyl)phthalate	10	330	2-Methylphenol	10	330
4-Bromophenyl phenyl ether	10	330	4- Methylphenol	10	330
Butyl benzyl phthalate	10	330	Naphthalene	10	330
Caprolactam	10	330	2-Nitroaniline	25	830
Carbazole	10	330	3-Nitroaniline	25	830
4-Chloroaniline	10	330	4-Nitroaniline	25	830
4-Chloro-3-methylphenol	10	330	Nitrobenzene	10	330
2-Chloronaphthalene	10	330	2-Nitrophenol	10	330
2-Chlorophenol	10	330	4-Nitrophenol	25	830
4-Chlorophenyl phenyl ether	10	330	N-Nitrosodiphenylamine	10	330
Chrysene	10	330	N-Nitroso-di-n-Propylamine	10	330
Dibenz(a,h)anthracene	10	330	2,2'- Oxybis (1-Chloropropane)	10	330
Dibenzofuran	10	330	Pentachlorophenol	25	830
Di-n-butyl phthalate	10	330	Phenanthrene	10	330
Di-n-octyl phthalate	10	330	Phenol	10	330
3,3'-Dichlorobenzidine	10	330	Pyrene	10	330
2,4-Dichlorophenol	10	330	2,4,5-Trichlorophenol	25	830
Diethyl phthalate	10	330	2,4,6-Trichlorophenol	10	330
2,4-Dimethylphenol	10	330			

Table 2-2
Analytical Parameters and Detection Limits
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

TAL Inorganic List and CRDLs

Constituent	Aqueous CRDL (µg/l)	Solid CRDL ** (µg/kg)	Constituent	Aqueous CRDL (µg/l)	Solid CRDL ** (µg/kg)
Aluminum	200	NS	Lead	3	NS
Antimony	60	NS	Magnesium	5,000	NS
Arsenic	10	NS	Manganese	15	NS
Barium	200	NS	Mercury	0.2	NS
Beryllium	5	NS	Nickel	40	NS
Cadmium	5	NS	Potassium	5,000	NS
Calcium	5,000	NS	Selenium	5	NS
Chromium	10	NS	Silver	10	NS
Cobalt	50	NS	Sodium	5,000	NS
Copper	25	NS	Thallium	10	NS
Cyanide	10	NS	Vanadium	50	NS
Iron	100	NS	Zinc	20	NS

Additional Analyses/Constituents for Soil and Sediment

Analysis/Constituent	Method	Detection Limit
Grain Size	ASTM D422	0.50 percent
Total Organic Carbon (TOC)	USEPA 415 or SW-846 9060	100,000 µg/kg
pH	SW-846 9045C	not applicable

Constituent List for Explosives and CRDLs

Constituent	CAS Number	Method	Detection Limit (µg/kg)
Pentaerythrite Tetranitrate (PETN)	78-11-5	SW-846 8330	NS
2,4-Dinitrotoluene	121-14-2	SW-846 8330	NS
2,6-Dinitrotoluene	606-20-2	SW-846 8330	NS
Octohydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	SW-846 8330	NS
2,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	SW-846 8330	NS
2,4,6-TNT	118-96-7	SW-846 8330	NS
1,3,5-Trinitrobenzene	99-35-4	SW-846 8330	NS
1,3-Dinitrobenzene	99-65-0	SW-846 8330	NS
Tetryl	479-45-8	SW-846 8330	NS
Nitrobenzene	98-95-3	SW-846 8330	NS
4-Amino-2,6-dinitrotoluene	19406-51-0	SW-846 8330	NS
2-Amino-4,6-dinitrotoluene	355-72-78-2	SW-846 8330	NS
2-Nitrotoluene	88-72-2	SW-846 8330	NS
3-Nitrotoluene	99-08-1	SW-846 8330	NS
4-Nitrotoluene	99-99-0	SW-846 8330	NS
Nitroglycerine	55-63-0	SW-846 8332	NS
Nitroguanidine	556-88-7	SW-846 8330	NS
Nitrocellulose	9004-70-0	USATHAMA	NS
Ammonium Perchlorate	7790-98-9	USEPA 314.0	NS

Notes and Abbreviations

TCL VOCs= Target Compound List volatile organic compounds
TCL SVOCs= Target Compound List semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)
NS – Not specified.
CRDL = Contract Required Detection Limit
* Aqueous CRDL is the instrument detection limit of pure water. Sample detection limits will undoubtedly be higher for some constituents.
** Solid CRDLs: Solid detection limits are not specified under Method ILM04. Soil results must be reported on a dry weight basis. Soil Method Detection Limits will vary between samples and must be included with individual sample results.
µg/kg = micrograms per kilogram

Table 2-3
Bottleware, Preservation, and Holding Time Requirements
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media	Analysis	Number of Containers per Sample	Container Type	Preservation	Holding Times
Surface Soil	TCL VOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to analysis
	TCL SVOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	TAL Inorganics	1	250 ml CWM glass	Cool to 4 °C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	Total Organic Carbon	1	8 oz. Glass with teflon cap	Cool to 4 °C	24 hours
	pH	1	250 ml plastic	Cool to 4 °C	6 months
Subsurface Soil	TCL VOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to analysis
	TCL SVOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	TAL Inorganics	1	250 ml CWM glass	Cool to 4 °C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
Sewer Sediment	TCL VOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to analysis
	TCL SVOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	TAL Inorganics	1	250 ml CWM glass	Cool to 4 °C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	Ammonium Perchlorate	1	4 oz. Glass	Cool to 4 °C	14 days to analysis
Wetland Sediment	Grain Size	1	250 ml CWM glass	Cool to 4 °C	6 months
	TCL SVOCs	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	TAL Inorganics	1	250 ml CWM glass	Cool to 4 °C	6 months; Hg 28 days
	Explosives - Modified SW-846-8330*	1	250 ml CWM glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	Ammonium Perchlorate	1	4 oz. glass	Cool to 4 °C	14 days to analysis
Wetland Surface Water	Hardness	1	250 ml plastic	HNO3 to pH<2; Cool to 4 °C	6 months
	TCL SVOCs	2	1 liter glass	Cool to 4 °C	14 days to extract; 40 days to analysis
	TAL Inorganics	1	1 liter glass	Cool to 4 °C	14 days to analysis
	Explosives - Modified SW-846-8330*	1	1 liter glass	Cool to 4 °C	14 days to analysis
	Ammonium Perchlorate	1	1 liter glass	Cool to 4 °C	14 days to analysis
Concrete/Soil Rubble from Chemical Disposal Pit Removal	Full TCLP	5	1-4 oz.glass (volatiles); 4-8oz. glass	Cool to 4 °C	7 days to extraction

Notes and Abbreviations

TCL VOCs= Target Compound List volatile organic compounds
TCL SVOCs= Target Compound List semivolatile organic compounds
TAL Inorganics = Target Analyte List inorganics (i.e., TAL metals and cyanide)
Full TCLP = Full Toxicity Characteristic Leaching Procedure
CWM - Clear Wide Mouth
* Explosives included nitroglycerin, nitrocellulose, nitroguanadine, and pentaerythrite tetranitrate (in addition to the list of analytes included in USEPA SW-846 Method 8330)
ml = milliliter
oz. = ounce
°C = degrees Celsius
Hg = mercury

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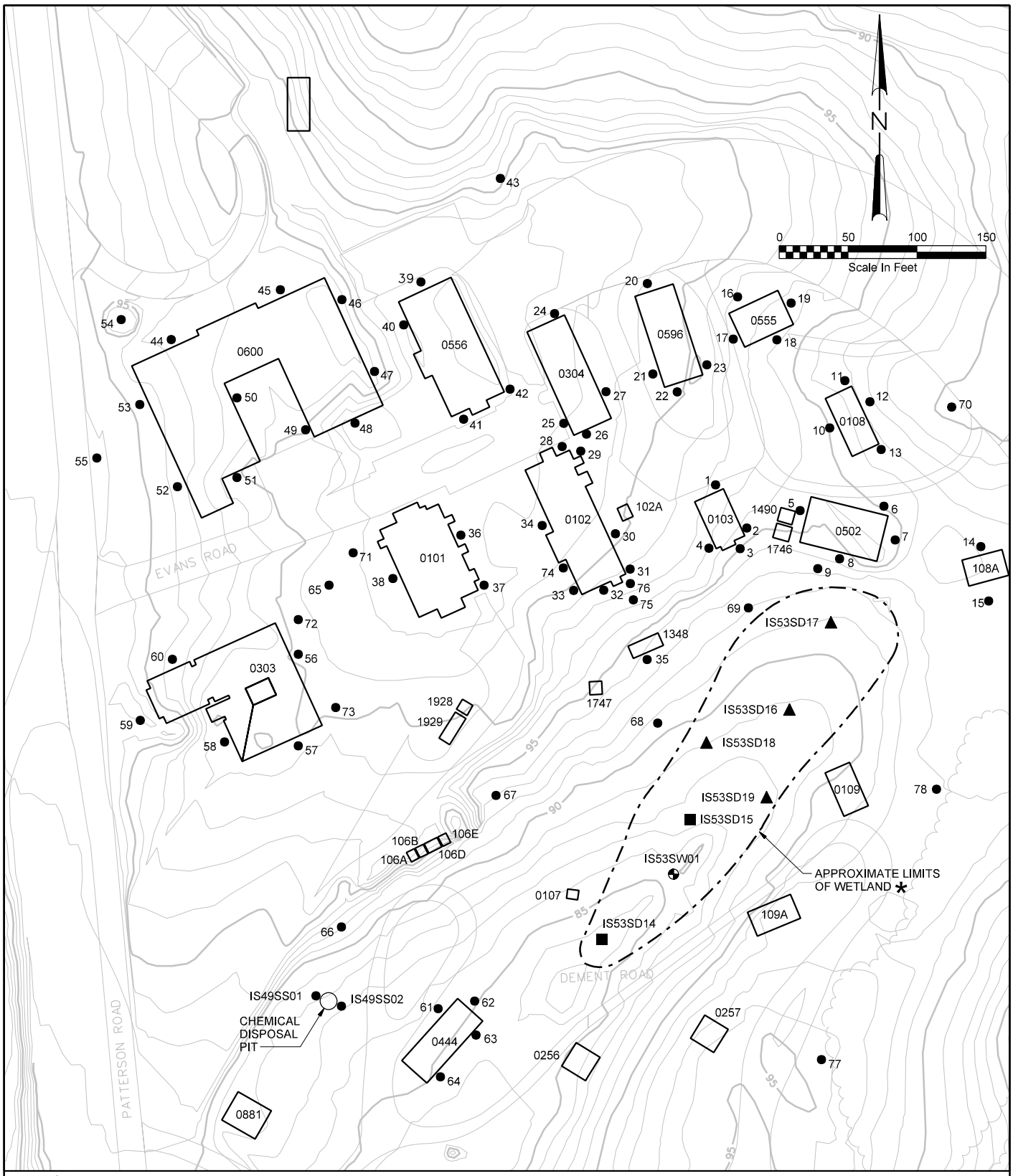

LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SITE 53 CONGLOMERATE SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ ANTICIPATED SEDIMENT SAMPLES WERE CLASSIFIED AS SURFACE SOIL SAMPLES DUE TO LACK OF SURFACE WATER AND/OR SATURATION
- ■ SEDIMENT SAMPLE LOCATION
- ◔ SURFACE WATER SAMPLE LOCATION
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

Figure 2-1
LAB AREA SURFACE SOIL AND WETLANDS SAMPLE LOCATIONS
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

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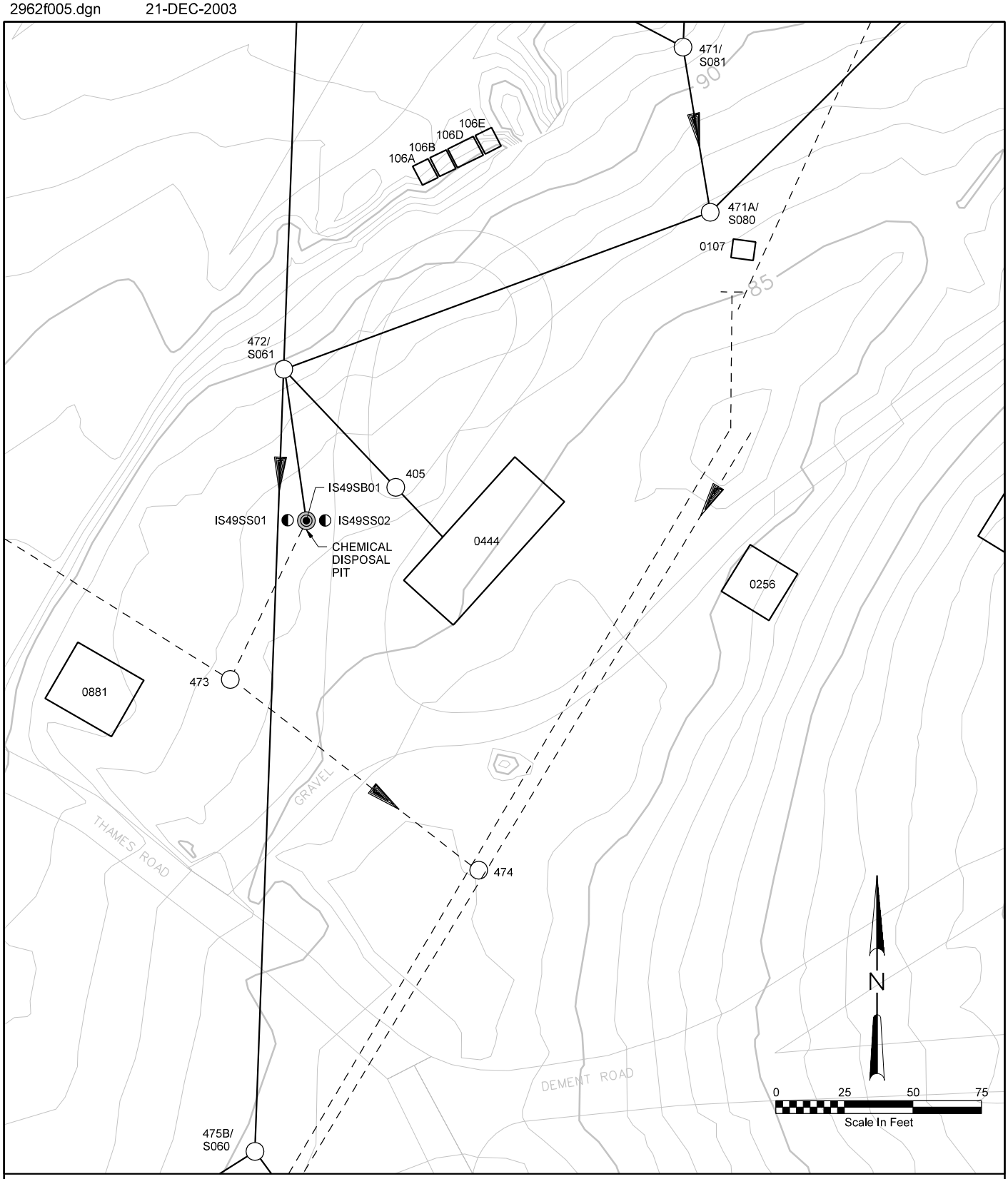


LEGEND

- SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- MANHOLE
- STORM SEWER
- SANITARY SEWER

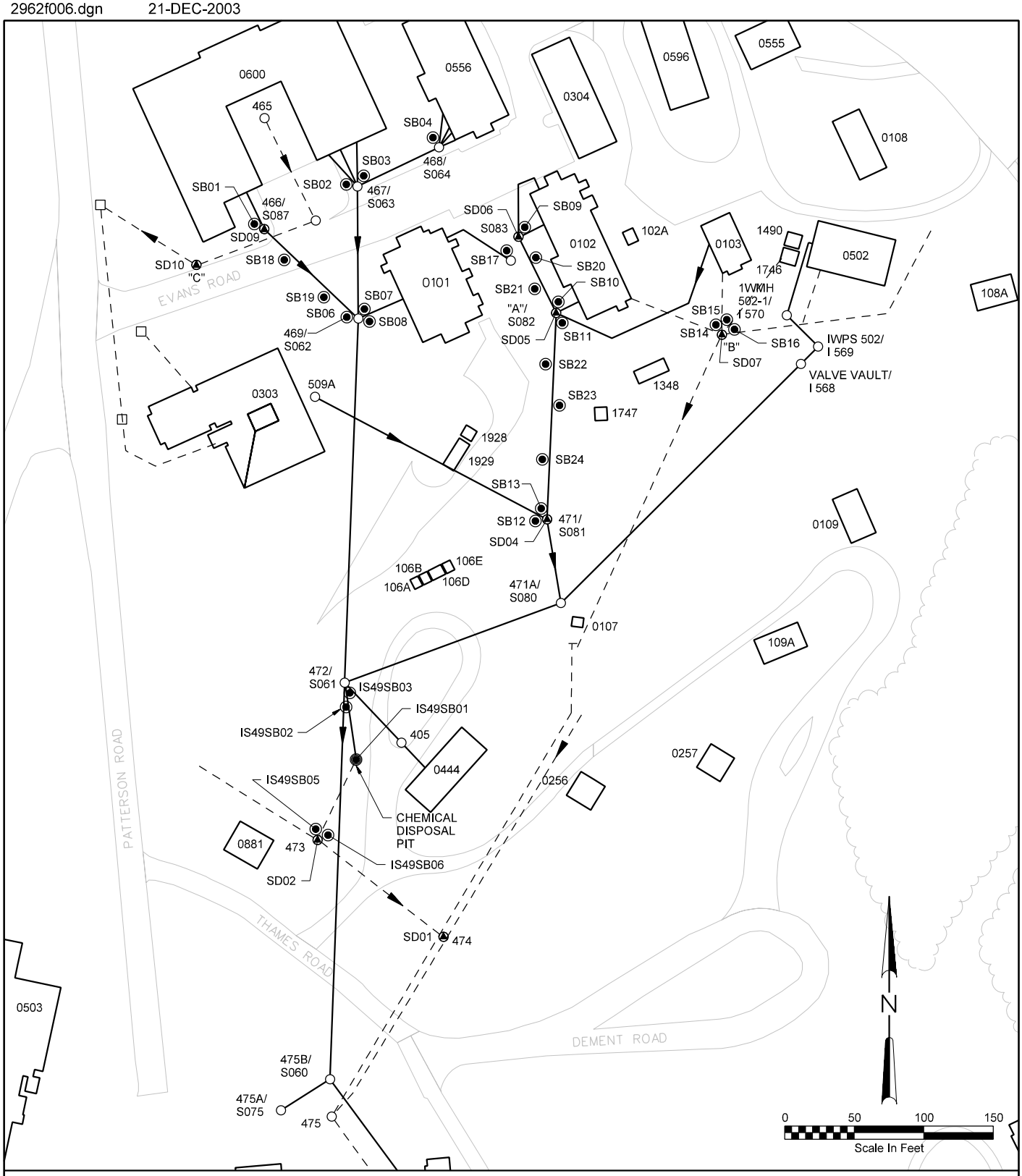
NOTES:

1. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
2. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO.670,579 AND 15,699.

Figure 2-2
SITE 49 - CHEMICAL DISPOSAL PIT CONFIRMATORY SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f006.dgn 21-DEC-2003



LEGEND

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER

NOTES:

1. SEDIMENT SAMPLE ID FORMAT WOULD BE IS53SD##.
2. SUBSURFACE SOIL SAMPLE ID FORMAT WOULD BE IS53SB##BDED. BD IS THE BEGINNING DEPTH AND ED IS THE ENDING DEPTH OF THE SUBSURFACE SOIL SAMPLE.
3. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
4. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
5. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
6. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

Figure 2-3
LAB AREA
SUBSURFACE SOIL AND
SEWER SEDIMENT LOCATIONS
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

SECTION 3

Nature and Extent of Contamination

This section discusses the nature and extent of contamination found in the soil, surface water, and sediment at the Lab Area at NDWIH, Indian Head, Maryland. . Table 3-1 lists the sample data that was rejected during the data validation process. Detected analytical results for all samples analyzed are presented in Tables 3-2 through 3-5. Complete analytical results for all media are provided in Appendix E.

The discussion presented below focuses on the contaminants that are most prevalent at the Lab Area. Select contaminants from each contaminant group (i.e., VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants which are generally recognized to pose the greatest risks to human health and the environment, and that exceeded established background levels at NDWIH.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus the discussion. The baseline Human Health Risk Assessment (HHRA), presented in Section 5, and the Ecological Risk Assessment (ERA), presented in Section 6, formally screen and evaluate all chemicals analyzed for in the various media at the Lab Area, in accordance with established USEPA Region III guidance.

In order to identify constituents that may be of potential concern at the Lab Area, the data for detected chemicals and analytes were compared to data presented in the *Draft Background Investigation Report* (BIR) prepared by Brown and Root Environmental (B&RE, 1997), as well as the *Background Soil Investigation Report* (BSIR) prepared by TTNUS (TTNUS, 2002). The BIR and BSIR were prepared to establish a facility-wide background data set to be used for current and future investigations. Samples were collected for various media from areas outside the sites known to be impacted from facility operations. The facility-wide background statistics for each media are presented in Appendix F.

In some instances, where an inorganic analyte is discussed in one medium (e.g., surface soil), the analyte may also be discussed in another medium (e.g., subsurface soil), even if the concentrations in the second medium did not exceed background. This is to allow a more complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a constituent in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used; (2) if a constituent was detected in a sample and a corresponding duplicate, the higher of the two values was used; and (3) samples collected upslope or upgradient (for the purpose of evaluating site-specific background conditions) are excluded from the descriptive statistics and following discussion in this section (except with respect to whether or not the observed concentrations of certain analytes may be site-related). Further into the evaluation of the data, it was determined that

some site-specific background samples should be included in the data set for the HHRA (refer to Section 5), due to the presence of some constituents, and the topographical location of the samples.

Background surface water samples and sewer sediment samples were not collected as part of either the BIR or BSIR. Therefore, background data for surface water and sewer sediment were not available for comparison.

3.1 Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique. Data quality is used to assess whether the project's data quality objectives were met. The data quality assessment comprised reviewing the results of the laboratory quality control (QC) review, the data validation reports, and the data validation qualifiers applied to the data.

3.1.1 Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Non-conforming results were identified and were discussed in the data package cover letter and associated case narrative.

3.1.2 Data Validation

The data packages were reviewed by an independent data validator based on the validation criteria outlined by USEPA Region III (USEPA, 1993 and 1994). As specified in USEPA Region III's *Innovative Approaches to Data Validation* (USEPA, 1995b), a level M-3 data validation was performed on the organic analytes and a level IM-2 data validation was performed on the inorganic analytes. This data review process was independent of the laboratory review. The review completed by the validator focused on the impact that the laboratory performance and matrix effect had on the analytical results. Areas of review included holding time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, and laboratory and field sample duplicate precision. Additionally, the analytical spectra and raw data output were reviewed and the laboratory results were recalculated from the raw data.

Only one result per analyte, per sample was reported. If a sample was reanalyzed or diluted, it was reported twice by the laboratory, but only the result with the best data quality was chosen for reporting.

The following data validation flags were applied to one or more analytical results:

- **U** - Not detected. Samples were analyzed for this analyte, but it was not detected above the contract required detection limit (CRDL). This flag is not an indicator of a quality control problem.
- **J -** Estimated. The analyte was present between the laboratory instruments method detection limit (MDL) and CRDL, but the reported concentration may not be accurate or precise and is considered an estimate.
- **UJ –** Not Detected, detection limit estimated. Samples were analyzed for this analyte, but the results were qualified as not detected; however, the concentration that the analyte was not detected at is estimated. The "UJ" qualifier tells the data user that the result was not detected, but the detection limit should be considered an estimate due to quality control results.
- **L –** Biased low. The analyte is present, but the reported value may be biased low. The actual value is expected to be higher than reported.
- **K –** Biased high. The analyte is present, but the reported value may be biased high. The actual value is expected to be lower than reported.
- **UL -** The analyte was not detected and the reported quantitation limit is probably higher than reported.
- **B -** Not detected. The analyte was found to be present due to blank contamination. The concentration of the field result is not detected substantially above the level reported in laboratory or field blanks.
- **D -** Diluted sample. The sample may have been diluted because the analyte concentration exceeded the working range of the instrument, or the sample matrix was such that the sample had to be diluted to aid in the identification of the analyte.
- **R**- Rejected. The analytical result is unusable. Note that the constituent may or may not have been detected.
- **(No qualifier present) -** Detected. The result for the target parameter is usable at the concentration reported.

3.1.3 Data Quality Evaluation

The data quality evaluation consisted of reviewing the analytical data for systematic errors, or patterns that are found in the distribution of data qualifiers. The distribution of data qualifiers and systematic errors are discussed below. An evaluation of the data quality is made based on the number, severity, and distribution of these data qualifiers. The findings of the data quality evaluation and the overall assessment are discussed in Section 3.1.3.1. These findings are used to make a conclusion of their impact on data usability, discussed in Section 3.1.3.2.

3.1.3.1 Data Quality Assessment Findings

Volatile Organic Compounds

VOCs were analyzed by USEPA Contract Laboratory Program (CLP) method OLM04.2. Including field quality control samples, 2,548 non-redundant data points were generated. Of these, 2 percent (i.e., 60 results) were "B"-qualified, 0.4 percent (i.e., 10 results) were "J"-qualified, and 0.6 percent (i.e., 15 results) were UJ-qualified. All B qualifiers were due to 1,1,2-Trichlorotrifluoroethane and methylene chloride contamination. This is not surprising as these two chemicals are common laboratory contaminants.

The majority of the J-qualified results are due to low sample concentrations: The laboratory is required to J-qualify sample results between the laboratory's MDL and the USEPA's CRDL.

The UJ qualifiers were applied to two constituents: acetone and methylene chloride. Initial calibration criterion was exceeded in both cases.

Semivolatile Organic Compounds

SVOCs were analyzed by USEPA CLP method OLM04.2. Including field quality control samples, 3,720 non-redundant data points were generated. Of these, 1 result was B-qualified, 8 percent (i.e., 287 results) were J-qualified, 0.7 percent (i.e., 27 results) were UJ-qualified, and 0.9 percent (i.e., 35 results) were "R"-qualified.

The B-qualified result was due to phthalates: Phthalates are a common laboratory contaminant, since plastics and some bottle ware contain small amounts of phthalates. Phthalates are used as plasticizers, the most common of which is bis(2-ethylhexyl)phthalate (BEHP), and are often introduced into samples during handling. Latex gloves are coated with plasticizers such as BEHP and di-n-butylphthalate to facilitate release of the gloves from the skin. Laboratory personnel sometimes wear latex gloves during sample extraction and handling. The CH2M HILL field team wore nitrile gloves during the Lab Area RI field effort, which would not contribute to phthalate contamination.

Two phthalates, di-n-butyl phthalate (DBP) and di-ethyl-phthalate, are used in insecticides and/or insect repellents. Therefore, it is possible that some phthalate detections could be a result of cross-contamination; however, all sampling was performed with decontaminated equipment and disposable sampling gloves to minimize any cross-contamination. Although some phthalate detections could be attributed to blank contamination, phthalates were not a risk to human health in the Lab Area (refer to Section 5), and only posed "minimal risks to soil invertebrates and terrestrial plants" for ecological risk (refer to Section 6).

The majority of the J-qualified results were due to low sample concentrations (i.e., estimated concentrations between the laboratory's MDL and the USEPA's CRDL). The remaining J- and UJ-qualified data were a result of low internal standard recoveries, or exceedances in continuing calibration criterion. Benzaldehyde was UJ-qualified in five samples due to continuing calibration exceedances. Low recovery of the internal standard Perylene-d_{12} accounted for approximately 60 percent of the remaining J- and UJ-qualified results, with Chrysene-d_{12} and 1,2-Dichlorobenzene-d_4 accounting for the remainder.

The rejected sample results were for caprolactam, all caused by low average relative response factors in the initial calibration. Table 3-1 lists all samples that have been qualified with an R.

Explosives

Explosives were analyzed by different methods. Nitroaromatics and nitroamines were analyzed by USEPA SW-846 Method 8330 and CLP Method OLM04.2. NG was analyzed by USEPA SW-846 Method 8332, NQ was analyzed by USEPA SW-846 8330 (Modified), and perchlorate was analyzed by USEPA Method 314. Including field quality control samples, 2,211 non-redundant data points were generated. Of these, 0.3 percent (i.e., seven results) were J-qualified, and 19 percent (i.e., 409 results) were UJ-qualified.

The majority of J-qualified results were due to low sample concentrations (i.e., sample concentrations between the laboratory's MDL and the USEPA's CRDL), while the remaining J- and UJ-qualified results were due to several constituents with initial calibration linearity criterion exceedances. These constituents included HMX; 1,3,5-TNB; 1,3-DNB; NB; 2,4,6-TNT; 2-amino-4,6-DNT; and 2,4-DNT.

Metals and Cyanide

Metals were analyzed by USEPA CLP Method ILM04, and USEPA Method 335.2 was used to analyze for cyanide. Including field quality control samples, 3,384 non-redundant data points were generated. Of these, 1 percent (i.e., 32 results) were B-qualified, 33 percent (i.e., 1,114 results) were J-qualified, 0.4 percent (i.e., 16 results) were "K"-qualified, 0.1 percent (i.e., 4 results) were UJ-qualified, 2 percent (i.e., 63 results) were "L"-qualified, 0.7 percent (i.e., 25 results) were "UL"-qualified, and 0.3 percent (i.e., 9 results) were R-qualified. Table 3-1 lists all sample results that were qualified with an R.

The B-qualified results were a result of beryllium contamination. About half of the "J" qualified results were due to low sample concentrations (i.e., concentrations between the laboratory's MDL and the USEPA's CRDL). The remaining J- and UJ-qualified results were due to exceedances in serial dilution criterion and duplicate imprecision. The most common metals that were J- and UJ-qualified were potassium, aluminum, zinc, lead, copper, and calcium.

The K-qualified results were due to high matrix spike recovery of mercury. The L- and UL-qualified results were due to low matrix spike recovery, or CRDL standard recovery below acceptable limits for the following constituents: mercury, chromium, silver, antimony, selenium, and arsenic.

The nine rejected results were due to matrix spike recoveries of selenium or mercury that were less than the lowest performance criteria. Selenium detection limits were R-qualified in the following samples: IS53SD01, IS53SD02, IS53SD04, IS53SD05, IS53SD06, IS53SD07, IS53SD10, and IS53SD10P. The mercury detection limit was qualified with an R in sample IS53SS42.

Wet Chemistry

Samples were analyzed for hardness by USEPA Wastewater Method 130.2, percent solids by UPEPA 160.3, pH by SW-846 9045C, and TOC by SW-846 9060. No wet chemistry data was qualified.

3.1.3.2 Impact of Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan; and
- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (USEPA, 1993 and 1994).

The data evaluation showed that the majority of the analytical results (i.e., 74 percent) were acceptable as reported without qualifiers. Twelve percent of the results were J-qualified as estimated in concentration. The vast majority of these J qualifiers were present because the analyte concentration was between the MDL and the CRDL. These J-qualified results were acceptable for use as reported. When this was considered, over 86 percent of the results were usable as reported, either without qualifiers, or qualified as estimated.

The J, K, L, UJ, and UL qualifiers indicated that the data values are estimated. These qualifiers can indicate the presence of a quality control problem, but not a problem that negatively affects the usability of the data. These data points were considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also were considered usable by the project team when assessing impacts to a site.

Sample results with a B qualifier made up 0.9 percent of the data. B qualifiers indicate that contamination may have come from outside sources that are not attributable to the site. Most of the B-qualified results were for methylene chloride and 1,1,2-trichlorotrifluoroethane. These chemicals are common laboratory contaminants, and their results should not be used, alone, to make project decisions. These results are acceptable to support project decisions (i.e., if a plastic component, such as styrene, is found in an area, then the presence of phthalates makes sense and the phthalate results should be considered in making project related decisions).

The R qualifier indicates that a sample has been rejected. It is not uncommon that some data will be rejected during a large and intricate RI. Often, the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at adjacent locations or sites. During this RI, less than 0.4 percent of the data, overall, were rejected. The results that were rejected should not be used to make project decisions.

With the exception of the R-qualified results (and with caution regarding the “B” qualified results), the data for the Lab Area RI at NDWIH were of sufficient quality to support risk and site assessment.

3.2 Surface Soil

Surface soil sampling activities conducted during this RI within the Lab Area consisted of collecting 84 surface soil samples. Section 2.1.2 describes the sampling analysis and location rationale. Of the 84 surface soil samples, 76 were surface soil samples characterizing the extent of contamination in the surface soil of the Lab Area (i.e., IS53SS01 through IS53SS76); two were site-specific background samples, upslope from the site (i.e., IS53SS77 and IS5378); four were dry sediment samples from the emergent wetland (i.e., IS53SD16 through IS53SD19); and two were confirmatory surface soil samples for the Chemical Disposal Pit removal action (i.e., IS49SS01 and IS49SS02). The results of the surface soil and dry sediment sampling are presented in Table 3-2. Statistical information on each sample as well as base-wide background data are presented in Table G-1 in Appendix G. Note that the upslope site-specific background samples are not included in the statistical analysis, but are included for comparison in Table G-1.

3.2.1 VOCs and SVOCs

3.2.1.1 VOCs

Nineteen of the 84 surface soil samples collected were analyzed for TCL VOCs and TCL SVOCs. The dry sediment samples were not analyzed for TCL VOCs, and only one of the dry sediment samples (i.e., IS53SD18) was analyzed for TCL SVOCs. The upslope, site-specific background surface soil samples (i.e., IS53SS77 and IS53SS78) were not analyzed for TCL VOCs nor TCL SVOCs.

PCE was detected in four surface soil samples (refer to Table 3-2). The detected concentrations ranged from 3.8 micrograms per kilogram (µg/kg) to 7.3 µg/kg, all at estimations between the MDL and CRDL. These detected concentrations were low and do not warrant further discussion.

3.2.1.2 SVOCs

SVOCs were detected in 18 of the 19 surface soil samples analyzed for SVOCs and in one dry sediment sample analyzed for SVOCs (refer to Table 3-2). This discussion focuses on the following constituents because of the high concentrations detected, the frequencies of the detections, the extent to which they exceeded the background concentrations, and the general health risks associated with them (Figure 3-1):

benzo(a)anthracene	di-n-butylphathalate
benzo(a)pyrene	fluoranthene
benzo(b)fluoranthene	indeno(1,2,3-cd)pyrene
butylbenzylphthalate	phenanthrene
Chrysene	pyrene

Benzo(a)anthracene was detected in 16 surface soil samples at concentrations ranging from 54 µg/kg to 7,700 µg/kg; benzo(a)pyrene was detected in 16 surface soil samples at concentrations ranging from 46 µg/kg to 6,300 µg/kg; and benzo(b)fluoranthene was detected in 16 surface soil samples at concentrations ranging from 63 µg/kg to 9,100 µg/kg.

The highest concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene occurred in the same surface soil sample, IS53SS20, on the northern side of Building 596. All were detected above their respective 95 percent UCL background concentrations (i.e., 480 µg/kg, 390 µg/kg, and 420 µg/kg, respectively) at this location.

Butylbenzylphthalate was detected in 10 surface soil samples at concentrations that ranged from 42 µg/kg to 23,000 µg/kg, with the highest concentration detected in sample IS53SS01, on the northern side of Building 103. Butylbenzylphthalate was not detected during either background study, so it is most likely site related. Chrysene was detected in 16 surface soil samples at concentrations that ranged from 55 µg/kg to 7,900 µg/kg, with the highest concentration detected in sample IS53SS20, on the northern side of Building 596, above the 95 percent UCL background concentration of 440 µg/kg. Di-n-butylphthalate was detected in 16 surface soil samples at concentrations that ranged from 45 µg/kg to 9,700 µg/kg, with the highest concentration detected in sample IS53SS35, on the southern side of Building 1348. Di-n-butylphthalate was not detected during either background study and, therefore, is most likely site related.

Fluoranthene was detected in 17 surface soil samples at concentrations that ranged from 64 µg/kg to 17,000 µg/kg; indeno(1,2,3-cd)pyrene was detected in 15 surface soil samples at concentrations that ranged from 41 µg/kg to 1,900 µg/kg; phenanthrene was detected in 16 surface soil samples at concentrations that ranged from 57 µg/kg to 13,000 µg/kg; and pyrene was detected in 17 surface soil samples at concentrations that ranged from 64 µg/kg to 14,000 µg/kg. The highest concentrations of fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene all occurred in sample IS53SS20, on the northern side of Building 596, above their respective 95 percent UCL background concentrations (i.e., 1,100 µg/kg, 100 µg/kg, 1,100 µg/kg, and 880 µg/kg, respectively).

The distributions of these 10 SVOCs reflect the fact that no distinct spatial pattern is apparent in the SVOC data. In most cases, where one SVOC is detected, several other SVOCs are also detected. It should be noted that SVOCs occur widely across the area sampled. Even the highest detections of all SVOCs occur in only a few samples (e.g., IS53SS01, IS53SS14, IS53SS20, and IS53SS39). Since all of the samples that had the highest detections for SVOCs were widely distributed across the site and its vicinity, a distinct spatial pattern can not be determined.

The SVOCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and butylbenzylphthalate are of particular concern due to their high concentrations outside of Building 103 (in sample IS53SS01), Building 108A (IS53SS14), Building 596 (IS53SS20), and Building 556 (IS53SS39). Interestingly, these maximum locations are near roads or paved areas where polynuclear aromatic hydrocarbon (PAH) might be present from vehicle exhaust or asphalt.

Little historical information on storage or use of SVOCs in Building 108A is available, but it is known that explosives and energetics were stored in the building. Although there is no historical documentation of SVOC use or storage, this does not necessarily mean that SVOCs were never present or used. Therefore, leaky storage, personnel physically dumping chemicals outside the building's northern doorway, surface runoff from the nearby paved area, or deposition from the air are possible causes of the SVOC contamination outside of this building. Similarly, Building 103 was not historically known for usage or storage of SVOCs, but rather for analyzing raw materials and manufactured propellants for surveillance tests.

Again, leaky storage, dumping, runoff, and deposition from the air are the potential causes of the SVOC contamination outside of this building.

No historical storage or usage of SVOCs are known for Buildings 556 and 596. Although there is no historical documentation of SVOC use or storage, this does not necessarily mean that SVOCs were never present or used. Building 596 is currently used, and was historically used, as a storage magazine and stability testing facility. Higher concentrations of SVOCs outside of these buildings might be due to leaky storage, dumping of chemicals outside of doorways of the buildings, surface runoff from nearby roadways, or deposition from the air.

The sample mean concentrations of eight of the mentioned SVOCs were greater than their respective base-wide background mean concentrations (butylbenzylphthalate and di-n-butylphthalate were not detected in either background study). Also, six of the other detected SVOCs in the Lab Area surface soil (during the RI) were not detected during either background study:

1,1-biphenyl -	(IS53SS20, northern side of Building 596)
acenaphthylene -	(IS53SS36, northeastern side of Building 101)
di-n-octylphthalate -	(IS53SS01, northern side of Building 103)
dibenz(a,h)anthracene -	(IS53SS20, northern side of Building 596)
diethylphthalate -	(IS53SD18, IS53SS01, IS53SS20, IS53SS35, IS53SS39, and IS53SS44; highest concentration in IS53SS35 on the southern side of Magazine 1348.
dimethylphthalate -	(IS53SS01, IS53SS14, and IS53SS28; highest concentration in IS53SS14 on the northern side of Building 108A.

Every detected SVOC sample mean concentration exceeded its respective base-wide sample mean concentrations, and no SVOCs were detected in the site-specific background samples. Therefore, it may be assumed that SVOCs detected in the surface soil at and/or near the Lab Area were related to operations at, or near, the Lab Area.

3.2.2 Explosives

All surface soil samples collected were analyzed for explosives (including PETN, NG, NC, and NQ). Four explosives compounds (2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, HMX, and NC) were detected in the surface soil and dry sediment samples (Table 3-2). Four samples contained the explosives compound 2,4-dinitrotoluene at concentrations ranging from 130 µg/kg to 7,300 µg/kg, with the highest concentration detected in sample IS53SS01, on the northern side of Building 103. These four samples (i.e., IS53SS01, IS53SS10, IS53SS35, and IS53SS74) were relatively close to each other around Buildings 102, 103, 108, and 1348. There does not appear to be a spatial pattern for these explosives in terms of site topography, historical building activities, and/or the absence of the explosives in other samples located near and around these samples.

The explosive compound 2-Amino-4,6-dintrotoluene was detected in one sample, IS53SS06, at a concentration of 2,135 µg/kg on the northeastern side of Building 502. HMX was also detected in one sample, IS53SS33, on the southwestern side of Building 102, at a concentration of 268,364 µg/kg (screening levels for HMX are higher than this concentration).

Figure 3-2 presents the concentrations of NC in the surface soil and dry sediment samples throughout the Lab Area. NC was detected in 22 samples, with concentrations ranging from 2,600 to 75,000 µg/kg. Some detection limits were greater in different samples due to varied soil moisture content. This variability makes discussion of the lower concentrations of NC (values near MDLs) arduous. The maximum concentration of 75,000 µg/kg was detected in dry sediment sample IS53SD18, suggesting that the emergent wetland is a likely collection point of NC. Additionally, the other elevated concentrations of NC were located at IS53SS07 (at a concentration of 14,000 µg/kg), IS53SS34 (15,000 µg/kg), IS53SS35 (14,000 µg/kg) and its duplicate (13,000 µg/kg), IS53SS69 (39,000 µg/kg), IS53SS74 (72,000 µg/kg), and IS53SS76 (16,000 µg/kg). These concentrations are boxed in Figure 3-2, and are spatially located in the east-southeastern portion of the Lab Area, mostly around and/or downslope from Buildings 102 and 108A, where NC was tested and stored, respectively.

NC was not detected during either background investigation, so base-wide background levels were not available for comparison. NC was not detected in upslope site-specific background sample IS53SS77, but was detected at 13,000 µg/kg in site-specific background sample IS53SS78. The high concentration of NC in IS53SS78 is likely due to its location, slightly downslope of Building 108A, a known storage magazine for NC (IS53SS15, on the downslope side of Building 108A had a NC concentration of 7,200 µg/kg). Therefore, it should be assumed that the explosives compounds detected in the surface soil at and/or near the Lab Area are related to operations at, or near, the Lab Area.

3.2.3 TAL Inorganics

All of the 84 Surface Soil samples were analyzed for metals. Twenty-four inorganic analytes were detected in the surface soil samples collected at the Lab Area during the RI (refer to Table 3-2). Every inorganic analyte was detected above facility-wide background 95-percent UCLs in one or more surface soil and dry sediment samples, including some analytes in the site-specific background samples (refer to Table G-1 in Appendix G). This discussion focuses on arsenic (refer to Figure 3-3), lead (refer to Figure 3-4), and mercury (refer to Figure 3-5), because of their detection frequencies, the extent to which they exceeded the background concentrations, and the general health risks associated with them.

3.2.3.1 Arsenic

Arsenic was detected in all of the surface soil and dry sediment samples, including the site-specific background samples. Concentrations ranged from 1.2 mg/kg to 66.1 mg/kg, with the sample mean concentration at 10.95 mg/kg, above the base-wide background mean of 4 mg/kg for surface soil. Additionally, 55 of the 82 samples contained arsenic concentrations greater than or equal to the base-wide background 95-percent UCL of 5.2 mg/kg. Site-specific background concentrations were 1.7 mg/kg and 10 mg/kg. Arsenic occurs naturally in soils in the Eastern U.S. as high as 73 mg/kg and in Maryland as high as 7.1 mg/kg (Appendix F). The following discussion of arsenic's nature and extent focuses on locations where arsenic was detected above the maximum site-specific background concentration of 10 mg/kg. Twenty-six of the 82 samples (i.e., 32 percent) had arsenic concentrations greater than 10 mg/kg.

Figure 3-3 presents the concentrations of arsenic in the surface soil and dry sediment samples throughout the Lab Area. Arsenic concentrations above the site-specific

background concentration of 10 mg/kg are boxed to focus the discussion. Most elevated concentrations of arsenic appeared in the eastern portion of the Lab Area around Buildings 102, 103, 108A, and 304. The highest concentration (i.e., 66.1 mg/kg in the duplicate of IS53SS26) was at the southern end of Building 304; however, concentrations above both facility-wide and site-specific background were present across the site and its vicinity (except for the northwestern portion of the Lab Area), suggesting that many of the arsenic detections may be related to activities at, or near, the site. This makes an arsenic spatial pattern difficult to discern.

Arsenic was historically used as an herbicide in the Lab Area and facility-wide. Monosodium methyl arsenate (MSMA), disodium methyl arsenate (DSMA), and cacodylic acid (dimethylarsenic acid) are commonly used as herbicides in modern days, while arsenic trioxide was used from the 1950s to the 1970s, and calcium arsenate was used as a pesticide until the 1960s.

3.2.3.2 Lead

Naturally occurring lead is present in soils in the Eastern U.S. as high as 300 mg/kg and in Maryland as high as 50 mg/kg (Appendix F). Lead was detected in all surface soil and dry sediment samples at concentrations ranging from 4.5 mg/kg to 31,200 mg/kg. The mean lead sample concentration of 987.36 mg/kg was more than fifty times the base-wide background average of 17.9 mg/kg. Seventy-five of the 82 samples (i.e., 91 percent) contained concentrations exceeding the background 95-percent UCL of 21.7 mg/kg. Additionally, 10 samples (i.e., IS53SS01, IS53SS02, IS53SS03, IS53SS04, IS53SS11, IS53SS12, IS53SS25, IS53SS26, IS53SS33, and IS53SS57) contained lead concentrations exceeding 1,000 mg/kg.

Figure 3-4 presents the concentrations of lead in the surface soil and dry sediment samples throughout the Lab Area. Lead concentrations above 1,000 mg/kg are boxed to focus the discussion. Except for sample IS53SS57 (on the southern side of Building 303), the highest lead concentrations were located in the northeastern portion of the Lab Area, directly adjacent to Buildings 102, 103, 108, and 304, where the soil is likely to have been affected by lead paint. Samples IS53SS26 (on the southern side of Building 302) and IS53SS57 (on the southern side of Building 303) had especially high concentrations at 31,200mg/kg and 14,100 mg/kg, respectively. Still, elevated levels of lead may be seen across the site. The concentrations of lead in the upslope site-specific background samples IS53SS77 and IS53SS78 were 8.3 mg/kg and 337 mg/kg, respectively. The elevated lead concentration in IS53SS78 may be due to its location, slightly downslope of Building 108A.

As with arsenic, elevated concentrations of lead, with respect to both facility-wide and site-specific background, were present across the site and its vicinity. It may be assumed that most of the lead detections are related to activities at, or near, the Lab Area, specifically due to the historical use of lead paint.

3.2.3.3 Mercury

Naturally occurring mercury is present in soils in the Eastern U.S. as high as 3.4 mg/kg and in Maryland as high as 0.14 mg/kg (Appendix F). Mercury was detected in 76 out of 81 surface soil and dry sediment samples in the Lab Area (one non-detect sample concentration was rejected by the data validator). Concentrations ranged from 0.12 mg/kg to 962 mg/kg.

The sample mean concentration of 52.40 mg/kg was three orders of magnitude greater than the base-wide background mean of 0.05 mg/kg, and every detected sample concentration exceeded the base-wide background 95-percent UCL of 0.06 mg/kg. The concentrations of mercury in the upslope site-specific background samples IS53SS77 and IS53SS78 were 0.13 mg/kg and 0.51 mg/kg, respectively, above the base-wide 95-percent UCL.

Figure 3-5 presents the concentrations of mercury in the surface soil and dry sediment samples throughout the Lab Area. As with arsenic and lead, elevated concentrations of mercury (as compared to facility-wide and site-specific background) were present across the site. Considerable mercury contamination is evident in the surface soil around Building 101, 102, 102, 108, 108A, 304, 556, and 600, as well as in the emergent wetland, where the maximum mercury concentration of 962 mg/kg was detected (in dry sediment sample IS53SD18).

Ten surface soil samples (i.e., IS53SS01, IS53SS02, IS53SS03, IS53SS32, IS53SS48, IS53SS49, IS53SS64, IS53SS74, IS53SS75, and IS53SD18) had mercury concentrations above 100 mg/kg. These concentrations are boxed in Figure 3-5 to focus the discussion. These high concentrations were spread throughout the site around Buildings 102, 103, 444, and 600, as well as in the emergent wetland area. Historical use of mercury in these buildings is well known, but the highest mercury concentration of 962 mg/kg in dry sediment sample IS53SD18 suggests that the emergent wetland is likely a collection point for mobile mercury in the Lab Area surface soils. Additionally, there may have been some sort of historical dumping at or near the emergent wetland. Research after the field investigation (i.e., pipe repairs) found leaking freshwater pipes below the surface of the emergent wetland, most likely supplying the emergent wetland with the majority of its water.

It should be noted that all mercury detections in the Lab Area were considered elevated, as compared to background and risk values (refer to the HHRA in Section 5 and ERA in Section 6). It should be assumed that the mercury detections are related to activities at, or near, the Lab Area.

Mercury contamination may result from physical dumping of mercury, leaking pipes, etc., but also, mercury contamination may be a result of anthropogenic deposition of mercury due to various processes and application of mercury. Table 3-6 is adapted from the USEPA's *Mercury Study Report to Congress*, December 1997. The table summarizes the various area and point sources of anthropogenic mercury contamination. The obvious sources of mercury contamination in the Lab Area would be physical dumping of mercury for disposal; the storage, accidental breakage, and disposal (through leaky pipes) of mercury for various laboratory experiments and instruments (e.g., nitrometers, pycnometers, talianis, and thermometers); and the testing, production, and storage of explosives.

3.3 Subsurface Soil and Sewer Sediment

Subsurface soil sampling activities conducted within the Lab Area during this RI consisted of collecting 28 subsurface soil samples (i.e., IS49SB01 through IS49SB03, IS49SB05, IS49SB06, IS53SB01 through IS53SB04, and IS53SB06 through IS53SB24) using a DPT rig. Twenty-nine were anticipated, but because of refusal at one location, sample IS53SB05 was

not collected (with consensus from EFACHES and MDE). Subsurface soil sample IS49SB01 was also the confirmatory subsurface soil sample for the Chemical Disposal Pit removal.

IS49SB01 was collected directly from the excavation bucket during the pit excavation, while the rest of the subsurface soil samples were collected with a macrocore Teflon tube sampler using a DPT rig. This allowed for an elementary soil classification at each sample depth. Because of varying sample depths throughout the site, it was possible to determine that the site geology consisted of approximately 4 feet of silty sand and silty clays, below which was thick clay at all locations.

Sewer sediment sampling activities consisted of collecting eight sewer sediment samples (i.e., IS53SD01, IS53SD02, IS53SD04 through IS53SD07, IS53SD09, and IS53SD10). Fourteen sediment samples were anticipated, but insufficient sediment volume in manholes MH472, MH469, MH465, MH467, MH468, and MH475B prevented the collection of six samples. Insufficient sediment in these manholes was also reported during the E/A&H SI (1994).

An attempt was made to correlate subsurface bedding soil outside of particular manholes with the sediment inside the manholes, and is discussed relative to each parameter in this section. The results of the subsurface soil sewer bedding sampling and the sewer sediment sampling are presented together in Table 3-3. Figures 3-6 through 3-9 present detections of selected constituents, as discussed below. Statistical information for the subsurface soil samples, as well as base-wide background data, are presented in Table G-2 in Appendix G. Statistical information for the sewer sediment samples is presented in Table G-3 in Appendix G. Note that there are no site-specific background samples for subsurface soil or sewer sediment, and no base-wide background information for sewer sediment.

3.3.1 VOCs and SVOCs

3.3.1.1 VOCs

Ten of the 28 subsurface soil pipe bedding samples were analyzed for TCL VOCs and TCL SVOCs. Sample locations were placed to assess contamination from Buildings 103 and 502 (Site 15) and the Chemical Disposal Pit (Site 49). The eight sewer sediment samples were analyzed for TCL VOCs and TCL SVOCs. Low concentrations of three VOCs (i.e., cumene, PCE, and TCE) were observed in two subsurface soil samples (i.e., IS49SB01 and IS53SB13, near Manhole A), and low concentrations of PCE were found in two sewer sediment samples (i.e., IS53SD05, near Manhole A, and IS53SD09, near Manhole 466) (refer to Table 3-3).

PCE was detected at 54 µg/kg beneath the chemical disposal pit in confirmatory subsurface soil sample IS49SB01, but not in any other subsurface soil or sediment sample associated with the Chemical Disposal Pit. This suggests that VOC contamination was localized, directly beneath the pit. Recall that the abandoned OWAP prevented excavation deeper than 8 inches beneath the Chemical Disposal Pit (refer to Section 2.1.5). Cumene and TCE were also detected beneath the Chemical Disposal Pit at low, estimated concentrations between the MDL and CRDL (i.e., 7.9 µg/kg and 3.1 µg/kg, respectively). PCE was detected at a low, estimated concentration between the laboratory's MDL and CRDL in confirmatory surface soil sample IS49SS02 (i.e., 4.5 µg/kg).

PCE was also detected at a low, estimated concentration between the laboratory's MDL and CRDL in subsurface soil samples IS53SB13 (i.e., 9.9 µg/kg), associated with Manhole 471.

This manhole ultimately received wastewater discharge from Building 103, after the new PVC line was routed from Building 103 to Manhole A (refer to Section 1.4.1). Note that no VOCs were detected in sewer sediment samples from Manholes 471 or B, nor were there VOCs in any other samples associated with these manholes.

Overall, the VOC subsurface soil and sewer sediment data does not suggest that there is significant VOC contamination because of leaky sewers or manholes.

3.3.1.2 SVOCs

Five SVOCs [i.e., butylbenzylphthalate, di-n-butylphthalate, diethylphthalate, pyrene, and bis(2-ethylhexyl)phthalate] were detected in 9 of the 10 subsurface soil samples (refer to Table 3-3). All of these detected subsurface soil SVOC concentrations were J-qualified as estimated by the data validator, since the concentrations were between the laboratory's MDL and CRDL.

Diethylphthalate, pyrene, and bis(2-ethylhexyl)phthalate were detected in the Chemical Disposal Pit confirmatory subsurface soil sample IS49SB01 at estimated concentrations between the laboratory's MDL and CRDL (i.e., 110 µg/kg, 40 µg/kg, and 54 µg/kg, respectively). Diethylphthalate and pyrene were not detected during either background study. Bis(2-ethylhexyl)phthalate had a base-wide background 95 percent UCL of 120 µg/kg. Of these SVOCs, only pyrene was detected in the Chemical Disposal Pit confirmatory surface soil samples (but below base-wide background), and only bis(2-ethylhexyl)phthalate was detected in the sewer sediment sample from Manhole 473 (associated with the Chemical Disposal Pit). Detections in the confirmatory surface soil samples and the associated Manhole 473 sewer sediment sample were all low, estimated concentrations between the MDL and CRDL.

There were additional (low, estimated) detections of these SVOCs that may show a direct correlation between sewer sediment and subsurface soil concentrations (possibly suggesting that pipes and/or manholes are leaking):

- Bis(2-ethylhexyl)phthalate was detected both inside (at 79 µg/kg) and outside (at 50 µg/kg and 51 µg/kg) of Manhole 473, suggesting that there may be a crack or fracture in Manhole 473 and/or the sewer line between the Chemical Disposal Pit and Manhole 473. Note that the Chemical Disposal Pit was removed, and the line between it and Manhole 473 was abandoned (refer to Sections 2.1.5 and 3.6).

- Diethylphthalate and bis(2-ethylhexyl)phthalate were detected in the Manhole 471 sediment (at 480 µg/kg and 75 µg/kg, respectively) and outside the manhole in the subsurface soil (at 300 µg/kg and 99 µg/kg, respectively). This may confirm the 1988 Video Survey (i.e., roots breaking through the terra cotta, cracked joints, and offset joints in line from Manhole A to Manhole 471). Although this pipe is in poor condition, it is promising that these concentrations are low, and that there were no detections of SVOCs (or VOCs) in the subsurface soil bedding samples along the pipe line segment (although mercury was detected at an estimated concentration in subsurface soil sample IS53SB23, halfway down the pipe; see below).

- Di-n-butylphthalate was detected both inside (at 73 µg/kg) and outside (at 97 µg/kg, 90 µg/kg, and 73 µg/kg) of Manhole B, suggesting that there may be a crack or fracture

in Manhole B and/or the sewer lines between Building 102 and Manhole B, Building 103 and Manhole B, and/or Building 1490 and Manhole B.

Fourteen other SVOCs [i.e., 3- and 4-methylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, butylbenzylphthalate, chrysene, di-n-butylphthalate, diethylphthalate, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene, and bis(2-ethylhexyl)phthalate] were detected in the 10 sewer sediment samples (refer to Table 3-3). Again, most detected concentrations were qualified as estimated between the MDL and CRDL.

The highest concentrations of SVOC contamination occurred in Manholes 466 and Manhole C. Sample IS53SD09 (from MH466) had a diethylphthalate concentration of 1,100 µg/kg and sample IS53SD10 (from Manhole C) had a concentration of 3,500 µg/kg (refer Figure 3-6). Benzo(b)fluoranthene was detected at 680 µg/kg in MH466 and at 580 µg/kg in Manhole C. These SVOCs are most likely from laboratory activities inside Building 600, since these manholes are directly outside of the building, and only receive wastewater and drainage from this building.

SVOCs detected in the subsurface soil and sewer sediment at the site and in its vicinity may be site-related, considering the absence of SVOCs in the subsurface background samples, the lack of sewer sediment background data, and the presence of various SVOCs both inside and outside of various manholes.

3.3.2 Explosives

NC was detected in the Chemical Disposal Pit confirmatory subsurface soil sample IS49SB01 at 5,900 µg/kg. NC was also detected in sewer sediment samples IS53SD04 (from Manhole 471) and IS53SD09 (from Manhole 466) at 5,000 µg/kg and 10,000 µg/kg, respectively (refer to Table 3-3). The maximum concentration of 10,000 µg/kg in Manhole 466 suggests that NC was washed down the drains of laboratories in Building 600. No explosives were detected in the subsurface soil around Manhole 466. The explosive 4-nitrotoluene was detected at 1,100 µg/kg just beside the discharge pipe into an open grate manhole from Building 101 (that this RI refers to as the "dry well").

It is notable that various explosives were detected in Manhole B during the E/A&H SI (Table 1-7), yet none were detected during this RI. No correlation between subsurface soil and sewer sediment data for explosives could be ascertained. Therefore, the explosives subsurface soil and sewer sediment data did not suggest that there is significant explosives contamination in the Lab Area resulting from leaky sewers or manholes.

3.3.3 TAL Inorganics

Twenty-two inorganic analytes were detected in the subsurface soil samples collected from the pipe bedding in the Lab Area, while 24 were detected in the sewer sediment (refer to Table 3-3). Arsenic, calcium, copper, iron, lead, mercury, potassium, sodium, vanadium, and zinc were all detected above facility-wide background 95 percent UCLs in one or more subsurface soil samples (refer to Tables 3-2 and G-2). Note that there are no background data for sewer sediment (refer to Table G-3). Cyanide was detected at 12.34 mg/kg in sediment sample IS53SD10 (from Manhole C), most likely from being washed down the drains of laboratories in Building 600.

This discussion focuses on arsenic (refer to Figure 3-7), lead (refer to Figure 3-8), and mercury (refer to Figure 3-9), because of the frequency of their detections, the extent to which they exceeded the background concentrations, the extent of their historical use in the Lab Area, and the general health risks associated with them.

3.3.3.1 Arsenic

Arsenic was detected in 24 of 28 subsurface soil samples and all 8 of the sewer sediment samples (refer to Table 3-3 and Figure 3-7). Concentrations in the subsurface soil ranged from 1.2 mg/kg to 25.1 mg/kg, while concentrations in the sewer sediment ranged comparably from 1.5 mg/kg to 16.9 mg/kg. The maximum subsurface soil arsenic concentration of 25.1 mg/kg was in the confirmatory sample under the Chemical Disposal Pit (refer to Section 3.6). Only 3 of the 24 subsurface soil detected concentrations (i.e., 13.5 mg/kg in IS53SB10, 11.4 mg/kg in IS53SB11, and 10.8 mg/kg in IS53SB22) were greater than the base-wide background 95 percent UCL of 9.8 mg/kg for subsurface soil. The arsenic subsurface soil sample mean concentration was 5.83 mg/kg, below the base-wide background mean of 7.6 mg/kg, and within the range of naturally occurring arsenic in soils in the Eastern U.S. (0.1 mg/kg to 73 mg/kg) and in Maryland (1.1 mg/kg to 7.1 mg/kg) (refer to Appendix F). Since these levels of arsenic seem to be in the range of naturally occurring arsenic, they do not necessarily implicate specific contamination, especially when compared to the surface soil arsenic concentrations (sample mean concentration of 19.95 mg/kg; refer to Section 3.2.3). The depth below ground surface of the samples, coupled with the silty clay substrata suggest that arsenic concentrations in the subsurface soil may not come from infiltration, but may be naturally present.

The sample mean of the sewer sediment was 7.3 mg/kg, but there are no background data available for comparison. The maximum arsenic concentration in sewer sediment was located at Manhole 474 (i.e., 16.9 mg/kg in IS53SD01). This manhole is the junction for storm sewers, both from the Lab Area and outside the Lab Area. Although arsenic concentrations in sewer sediment may be from runoff infiltration from herbicides used in the Lab Area, no correlation can be made between arsenic concentrations in the sewer sediment and in the subsurface soil adjacent to the respective manholes. Therefore, the arsenic subsurface soil and sewer sediment data did not suggest that there is significant arsenic contamination in the Lab Area subsurface soil because of leaky sewers or manholes.

3.3.3.2 Lead

Lead was detected in all 28 subsurface soil samples and all 8 sewer sediment samples (refer to Table 3-3 and Figure 3-8). Concentrations in the subsurface soil ranged from 5.6 mg/kg to 443 mg/kg, while concentrations in the sewer sediment ranged from 28.7 mg/kg to 1,510 mg/kg. The maximum subsurface soil lead concentration of 443 mg/kg was located beside Manhole A (servicing Building 102) and was above the base-wide background 95 percent UCL of 17.4 mg/kg for subsurface soil. The subsurface soil sample mean concentration was 30.23 mg/kg, above the base-wide background mean of 12.9 mg/kg, but still within the typical range for soil. Removing the maximum subsurface soil lead concentration of 443 mg/kg from the calculations, the subsurface soil sample mean concentration would be approximately 14 mg/kg. The sample mean concentration of the sewer sediment was 328.95 mg/kg, but there were no background data available for comparison. The maximum concentration of lead in the sewer sediment was in sample

IS53SD04 (from Manhole 471) at 1,510 mg/kg. Manhole 471 is the junction manhole for sewer lines from Buildings 102, 103, and 303.

Lead concentrations in the subsurface soil averaged higher than base-wide background, but fell in the range of naturally occurring lead in soils in the Eastern U.S. (10 mg/kg to 300 mg/kg) and in Maryland (10 mg/kg to 50 mg/kg) (refer to Appendix F). All subsurface soil samples were below 53 mg/kg, except for the maximum concentration in IS53SB10 (i.e., 443 mg/kg) by Manhole A. There seems to be a correlation between this maximum subsurface soil lead concentration and the sewer sediment lead concentration in Manhole A (i.e., 125 mg/kg). In addition, high lead concentrations were located in the surface soil near Manhole A (e.g., in surface soil sample IS53SS33), suggesting possible infiltration from the surface. Further, Manhole 471, directly downstream from Manhole A, contained the highest concentration of lead (i.e., 1,510 mg/kg) in its sediment. It is promising that the lead concentrations in the subsurface soil around, and upstream of, Manhole 471 were in the normal range, especially when considering the poor condition of the sewer line from Manhole A to Manhole 471. Both of these manholes were recently refurbished, so lead concentrations in subsurface soil around these manholes may not be a result of leaky pipes or connections, but rather from the refurbishment activities resulting in cross-contamination.

Most of the pipes in the Lab Area are known to be vitrified clay, terra cotta, PVC, or cast iron. Thus, lead pipes are not a likely source of subsurface soil contamination. Lead solder from cast iron pipes is a possible source; however, when a pipe is repaired, any leaded joints that are found are replaced. Lead-based paint used on the Lab Area buildings (that weathered and was deposited in surface soils and has subsequently runoff into the sewers through manholes), solder in buildings, and laboratory waste are other possible sources.

Terra cotta pipes are made from clay, which may contain minute amounts of natural lead; however, glazes that are applied to terra cotta objects for aesthetic reasons (e.g., architecture, pottery, etc.) can contain lead to obtain a yellow coloring. The terra cotta pipes at the Lab Area are reddish in color and do not have a yellow glaze, based on field observations during the RI field activities. It is considered unlikely that elevated lead concentrations in the subsurface soil could be a result of lead leaching from the terra cotta pipe material at the Lab Area.

Sewer sediment and subsurface soil from the pipes and manholes servicing Building 102 contained considerable levels of lead. The lead seems to have been transported and accumulated mostly in Manhole 471, and in the subsurface soil on the northern side of Manhole A.

With the exception of some isolated areas (i.e., Manhole A subsurface soil and Manhole 471 sediments), it is unlikely that activities in and/or near the Lab Area have caused extensive lead contamination in the subsurface soil and in the sewer sediment.

3.3.3.3 Mercury

Mercury was detected in 16 of the 28 subsurface soil samples and all 8 of the sewer sediment samples (refer to Table 3-3 and Figure 3-9). Concentrations in the subsurface soil ranged from 0.16 mg/kg to 362 mg/kg, while concentrations in the sewer sediment ranged from 0.34 mg/kg to 1,290 mg/kg. The maximum mercury concentration of 362 mg/kg in the

subsurface soil was located beside Manhole 471, servicing Buildings 102, 103, and 303. The subsurface soil sample mean concentration was 15.56 mg/kg, three orders of magnitude greater than the base-wide background mean of 0.06 mg/kg. Additionally, 14 of the mercury-detected subsurface soil samples had concentrations greater than the base-wide background 95 percent UCL of 0.18 mg/kg. The maximum mercury concentration occurred in sewer sediment sample IS53SD04 (from Manhole 471) at 1,290 mg/kg. The sample mean concentration of the sewer sediment was 265.53 mg/kg, but there were no background data available for comparison.

Mercury concentrations in the subsurface soil averaged higher than base-wide background, as well as the range of naturally occurring mercury in soils in the Eastern U.S. (0.01 mg/kg to 3.4 mg/kg) and in Maryland (0.04 mg/kg to 0.14 mg/kg) (Appendix F). Many of the sewer sediment samples contained higher concentrations of mercury as compared to the subsurface soil samples, and some correlation was evident between sewer sediment and subsurface soil samples. In particular, Manhole 471 (directly downstream of Manhole A) contained a high concentration of mercury (i.e., 1,290 mg/kg in sample IS53SD04), correlating with a high concentration in associated subsurface soil sample IS53SB13 (i.e., 362 mg/kg). Similarly, the sediment mercury concentration in Manhole A (547 mg/kg in sample IS53SD05) correlated with associated subsurface soil sample IS53SB10 (i.e., 32.4 mg/kg).

Recall that 1 pound of mercury was removed from Manhole A (which serves Buildings 103 and 102) in 1989; mercury was used in laboratory equipment and procedures in Buildings 102 and 103; and approximately 28,000 pounds of mercury were disposed of down the drains in Building 102 (refer to Section 1.4.5). Manholes A and 471 were recently refurbished, so mercury concentrations in subsurface soil around these manholes may not only be a result of leaky pipes or connections, but also from the recent refurbishment activities of these manholes, resulting in possible cross-contamination. Also, as with lead, some higher mercury concentrations were located in the surface soil near Manhole A (i.e., in surface soil samples IS53SS33 and IS53SS74), suggesting possible infiltration from the surface.

Where possible, a comparison was made with the mercury levels detected in the 1992 SI (E/A&H, 1994):

- Mercury was not detected in any of the subsurface soil samples collected during the 1992 SI, whereas it was detected at 16 subsurface soil locations during this RI (likely because subsurface soil samples in the RI were closer to subsurface pipes and lines); and
- The mercury concentration in Manhole B, where 10 pounds of mercury was recovered in 1969 (refer to Section 1.4.1), doubled from 52 mg/kg during the 1992 SI to 120 mg/kg during this RI.

Overall, every sediment sample demonstrated elevated levels of mercury, with some correlation to subsurface soil samples associated with the manholes, suggesting that mercury contamination in the subsurface soil occurred because of deteriorated piping and manhole connections. Mercury contamination was expected in the Lab Area due to the various laboratory activities involving mercury, and elevated levels above base-wide background are assumed site-related.

3.4 Emergent Wetland Surface Water

Surface water sampling activities conducted within the Lab Area consisted of collecting one surface water sample from a channel that developed in the emergent wetland, within the limits of the Lab Area (refer to Figure 3-10). Section 2.1.4.1 described the sampling analyses and location rationale. Three surface water samples were anticipated in the emergent wetland, but limited water in the channel prevented the collection of the other two surface water samples. The results of the surface water sampling are presented in Table 3-4. Statistical information for the sample is presented in Table G-4 in Appendix G. Note that there are no site-specific background samples for surface water and no base-wide background information for surface water.

3.4.1 SVOCs

No SVOCs were detected in the surface water sample.

3.4.2 Explosives

No explosives were detected in the surface water sample.

3.4.3 TAL Inorganics

Eighteen inorganic analytes were detected in the surface water sample (refer to Table 3-4). Little discussion is warranted since concentrations of these analytes were relatively low. This discussion focuses on total arsenic, total lead, and total mercury because they are the focus of discussion for other media in the Lab Area.

Total arsenic was detected at 47 µg/L, total lead was detected at 5.2 µg/L, and mercury was detected at 1 µg/L in surface water sample IS53SW01 (refer to Figure 3-10). No spatial trend can be discerned with one sample; however, the surface water area is limited in the emergent wetland. The arsenic concentration in the surface water seems to correlate with elevated arsenic concentrations in the Lab Area surface soil. The surface water arsenic concentration, as well as lead and mercury, are most likely attributed to surface runoff, and are ultimately assumed related to Lab Area activities.

3.5 Emergent Wetland Sediment

Wetland sediment sampling activities conducted within the Lab Area consisted of collecting six sediment samples (refer to Figure 3-11). Section 2.1.4.2 described the sampling analyses and location rationale. Of the six sediment samples, four samples (i.e., IS53SD16 through IS53SD19) were dry during sampling, and were treated as surface soil samples for discussion and risk assessment in this RI Report (refer to Sections 2.1.3.1 and 2.1.4.2). Results for the remaining two sediment samples (i.e., IS53SD14 and IS53SD15) are presented in Table 3-5. Statistical information on each sample, as well as base-wide background data, are presented in Table G-5 in Appendix G. Note that there are no site-specific background sediment samples.

3.5.1 SVOCs

Only sample IS53SD14 was analyzed for TCL SVOCs. The only SVOC chemical detected was di-n-butylphthalate, at an estimated concentration of 140 µg/kg, between the MDL and CRDL (refer to Table 3-5). This chemical was not detected during the background study.

3.5.2 Explosives

No explosives were detected in either of the wetland sediment samples.

3.5.3 TAL Inorganics

Twenty inorganic analytes were detected in the two wetland sediment samples (refer to Table 3-5). Of these, nine analytes (i.e., arsenic, cadmium, cobalt, lead, mercury, silver, sodium, vanadium, and zinc) were detected at concentrations above base-wide background 95 percent UCLs for fresh water sediment. This discussion focuses on arsenic, lead, and mercury, because they are the focus of discussion for other media in the Lab Area (refer to Figure 3-11).

3.5.3.1 Arsenic

Arsenic was detected in both of the sediment samples at concentrations of 3.9 mg/kg and 20.2 mg/kg. Both sample concentrations were above the base-wide background mean of 3.3 mg/kg. The maximum concentration of 20.2 mg/kg (in sample IS53SD14) also exceeded the facility-wide background 95 percent UCL of 10.6 mg/kg. No spatial trend could be observed in the data generated from the sediment samples due to the limited number of samples, even when including the dry sediment samples. These sediment concentrations do not differ greatly from the surface soil sample concentrations (i.e., surface soil arsenic sample mean concentration was 10.95 mg/kg, whereas the freshwater sediment sample mean concentration was 12.05 mg/kg).

As with the surface soil, these levels of arsenic do not necessarily indicate contamination, especially since arsenic naturally occurs in soils in Maryland (1.1 mg/kg to 7.1 mg/kg) and the Eastern U.S. (0.1 mg/kg to 73 mg/kg) (refer to Appendix F). Although arsenic values in the sediment fall within these ranges, it is still possible that these levels of arsenic in the emergent wetland sediment are due to site-related activities, specifically the historical application of herbicides and possibly pesticides.

3.5.3.2 Lead

As discussed previously, naturally occurring lead in soils range from 10 mg/kg to 300 mg/kg the Eastern U.S. and 10 mg/kg to 50 mg/kg in Maryland (refer to Appendix F). Lead was detected in both wetland sediment samples at concentrations of 32.3 mg/kg and 82.8 mg/kg. Both sample concentrations exceeded the base-wide background mean of 23.1 mg/kg, and the maximum concentration of 82.8 mg/kg in sample IS53SD14 exceeded the base-wide background 95 percent UCL of 79.3 mg/kg. The mean wetland sediment lead concentration of 57.55 mg/kg was more than double the base-wide background mean concentration, but fell within the Eastern U.S. lead concentration range, and was just above the Maryland average range. No spatial trend could be observed in the data generated from the sediment samples due to the limited number of samples, even when including the dry sediment samples.

The emergent wetland is a low topographical collection point for surface runoff. With lead concentrations in the surface soil ranging from 4.5 mg/kg to 31,200 mg/kg in the Lab Area, it is not surprising to find elevated levels of lead at this topographic low. Therefore, lead in the emergent wetland sediment likely resulted from runoff from surface soil throughout the Lab Area.

3.5.3.3 Mercury

Mercury was also detected in both wetland sediment samples. Concentrations were 18.6 mg/kg and 24.5 mg/kg, with a sample mean concentration at 21.55 mg/kg, three orders of magnitude greater than the base-wide background mean of 0.07 mg/kg. Both sample concentrations exceeded the base-wide background 95 percent UCL of 0.2 mg/kg. No spatial trend could be discerned from the sediment samples data because of the limited number of samples.

Mercury concentrations in the emergent wetland averaged 21.55 mg/kg, whereas the surface soils averaged 52.40 mg/kg in the Lab Area. Both sample mean concentrations exceeded the range of naturally occurring mercury in Maryland (0.04 mg/kg to 0.14 mg/kg), suggesting that mercury contamination in the emergent wetland may be due to activities specific to the Lab Area. This is a reasonable assumption, considering that the emergent wetland is a topographical collection point for surface water runoff that may contain mercury, as well as other contaminants at the Lab Area, and that mercury was historically used, disposed of, and released in the Lab Area (refer to Sections 1.1.1 through 1.4.7). It is assumed that the mercury deposited in the emergent wetland resulted mainly from surface water runoff and soil erosion throughout the Lab Area.

Mercury in the emergent wetland may also be due to undocumented dumping. Also, recent fresh water leaks from under the emergent wetland area may have leached contaminants from deteriorated sewer lines (e.g., line from I568 Pipe Valve to Manhole 471A) through cracks in the pipe(s), or from contaminated subsurface soil, to the wetland sediment and surface water.

3.6 Chemical Disposal Pit Removal Action

The Chemical Disposal Pit at Site 49, installed over the OWAP during the 1970s (refer to Sections 1.4.9 and 2.1.5), was removed by Clean Harbors on May 15-16, 2001. Confirmatory samples were collected on the surface edges outside of the excavation and at the bottom of the excavation (Figure 2-2).

The pit was excavated 1 foot around the Chemical Disposal Pit concrete cylinder, exposing the bricks that used to be part of the OWAP, and the two sewer drainage pipes connecting the Chemical Disposal Pit to Manholes 473 and 472. The concrete cylinder was removed by hoisting it out and placing it into a rolloff container with the excavated soil. Attempting to excavate 1 foot below the Chemical Disposal Pit (i.e., the concrete cylinder) exposed a flat slab of concrete that appeared to be the abandoned OWAP (refer to Section 2.1.5).

3.6.1 Confirmatory Surface Soil Samples

The two surface soil confirmatory samples (i.e., IS49SS01 and IS49SS02) were also used for comparison to other surface soil data and risk assessment for the Lab Area (refer to

Section 3.2, the HHRA in Section 5, and the ERA in Section 6). The results of the confirmatory surface soil samples are presented in Table 3-2.

3.6.1.1 VOCs and SVOCs

The only VOC detected in the surface soil was tetrachlorethene at 4.5 µg/kg (refer to Table 3-2). This concentration was estimated between the laboratory's MDL and CRDL (i.e., J-qualified). Eleven SVOCs were detected in the two confirmatory surface soil samples, but were also estimated between the laboratory's MDL and CRDL for each SVOC.

3.6.1.2 Explosives

NC was detected in sample IS49SS02 at 2,600 µg/kg, just above the laboratory's MDL for NC (refer to Table 3-2). This concentration of 2,600 µg/kg was the lowest detection in all 84 surface soil samples, and was below the surface soil sample NC mean concentration of 4,966.67 µg/kg for all Lab Area surface soil, as well as below the MDL for most of the other surface soil samples.

3.6.1.3 TAL Inorganics

Nineteen inorganic analytes were detected in the confirmatory surface soil samples collected around the Chemical Disposal Pit (refer to Table 3-2). None had significant concentrations, as compared to the rest of the surface soil in the Lab Area.

3.6.2 Confirmatory Subsurface Soil Sample

The confirmatory subsurface soil sample (i.e., IS49SB01) was collected from the soil just above the concrete of the abandoned OWAP, about 5 ft-bgs. The sample was also used for comparison to other subsurface soil and risk assessment in the Lab Area (refer to Section 3.3, the HHRA in Section 5, and the ERA in Section 6). The results of the confirmatory subsurface soil sample are presented in Table 3-3.

3.6.2.1 VOCs and SVOCs

Three VOCs (i.e., cumene, PCE, and TCE) were detected in confirmatory subsurface soil sample IS49SB01. Cumene and TCE were qualified as estimated between the MDL and CRDL, and PCE was detected at 54 µg/kg. Although this concentration is below most risk screening values, it was the highest PCE concentration detected in the Lab Area soils, and suggests that some leaking could have occurred through or around the Chemical Disposal Pit during the period it was used for disposal activities. Another possible source is infiltration of various chemicals, including PCE around the sides of the Chemical Disposal Pit, due to spillage. The sides would be a preferential pathway to the undisturbed soil around the Chemical Disposal Pit.

Three SVOCs [i.e., diethylphthalate, pyrene, and bis(2-ethylhexyl)phthalate] were detected in the confirmatory subsurface soil sample, but all were at estimated concentrations between the MDL and CRDL.

3.6.2.2 Explosives

NC was detected at 5,900 µg/kg in the confirmatory subsurface soil sample. This was a relatively low concentration, though it was the only subsurface soil detection of NC in the

Lab Area. Other than leakage through the Chemical Disposal Pit, there is a possibility of infiltration at the sides of the Chemical Disposal Pit.

3.6.2.3 TAL Inorganics

Nineteen inorganic analytes were detected in the confirmatory subsurface soil sample collected beneath the Chemical Disposal Pit. Arsenic was detected at 25.1 mg/kg, lead at 25.2 mg/kg, and mercury at 0.53 mg/kg. These concentrations did not stand out as compared to the rest of the Lab Area subsurface soil samples.

3.7 References

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Table 3-1
Lab Area Rejected Results
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Sample ID	Constituent Group	Constituent Name
IS49SB010405	SVOC	Caprolactam
IS49SB020708	SVOC	Caprolactam
IS49SB02P0708	SVOC	Caprolactam
IS49SB030607	SVOC	Caprolactam
IS49SB050507	SVOC	Caprolactam
IS49SB060507	SVOC	Caprolactam
IS49SS010001	SVOC	Caprolactam
IS49SS020001	SVOC	Caprolactam
IS53SB130304	SVOC	Caprolactam
IS53SB140304	SVOC	Caprolactam
IS53SB150304	SVOC	Caprolactam
IS53SB160304	SVOC	Caprolactam
IS53SB170102	SVOC	Caprolactam
IS53SD01	SVOC	Caprolactam
IS53SD02	SVOC	Caprolactam
IS53SD04	SVOC	Caprolactam
IS53SD05	SVOC	Caprolactam
IS53SD07	SVOC	Caprolactam
IS53SD09	SVOC	Caprolactam
IS53SD10	SVOC	Caprolactam
IS53SD10	SVOC	Caprolactam
IS53SD10P	SVOC	Caprolactam
IS53SD14	SVOC	Caprolactam
IS53SD14P	SVOC	Caprolactam
IS53SD18	SVOC	Caprolactam
IS53SS240001	SVOC	Caprolactam
IS53SS280001	SVOC	Caprolactam
IS53SS350001	SVOC	Caprolactam
IS53SS35P0001	SVOC	Caprolactam
IS53SS360001	SVOC	Caprolactam
IS53SS390001	SVOC	Caprolactam
IS53SS440001	SVOC	Caprolactam
IS53SS490001	SVOC	Caprolactam
IS53SW01	SVOC	Caprolactam
IS53SW01P	SVOC	Caprolactam
IS53SD01	Inorganics	Selenium
IS53SD02	Inorganics	Selenium
IS53SD04	Inorganics	Selenium
IS53SD05	Inorganics	Selenium
IS53SD07	Inorganics	Selenium
IS53SD09	Inorganics	Selenium
IS53SD10	Inorganics	Selenium
IS53SD10P	Inorganics	Selenium
IS53SS420001	Inorganics	Mercury

Notes and Abbreviations

SVOCs= semivolatile organic compounds

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	Base-Wide	IS49SS01	IS49SS02	IS53SD16	IS53SD17	IS53SD18	IS53SD19	IS53SS01
Sample ID	Background	IS49SS010001	IS49SS020001	IS53SD16	IS53SD17	IS53SD18	IS53SD19	IS53SS010001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene			4.5 J	NA	NA	NA	NA	
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl				NA	NA		NA	
2-Methylnaphthalene	73			NA	NA		NA	
Acenaphthene	140			NA	NA		NA	
Acenaphthylene				NA	NA		NA	
Acetophenone	64			NA	NA		NA	210 J
Anthracene	260			NA	NA		NA	51 J
Benzaldehyde	59			NA	NA		NA	230 J
Benzo(a)anthracene	480	63 J	110 J	NA	NA		NA	160 J
Benzo(a)pyrene	390	70 J	110 J	NA	NA		NA	150 J
Benzo(b)fluoranthene	420	95 J	150 J	NA	NA		NA	230 J
Benzo(g,h,i)perylene	130	45 J	63 J	NA	NA		NA	46 J
Benzo(k)fluoranthene	360		48 J	NA	NA		NA	99 J
Butylbenzylphthalate				NA	NA		NA	23,000
Carbazole	130			NA	NA		NA	
Chrysene	440	76 J	130 J	NA	NA		NA	190 J
Di-n-butylphthalate		45 J	52 J	NA	NA	280 J	NA	890
Di-n-octylphthalate				NA	NA		NA	170 J
Dibenz(a,h)anthracene				NA	NA		NA	
Dibenzofuran	65			NA	NA		NA	
Diethylphthalate				NA	NA	77 J	NA	46 J
Dimethyl phthalate				NA	NA		NA	40 J
Fluoranthene	1100	120 J	230 J	NA	NA	64 J	NA	330 J
Fluorene	150			NA	NA		NA	
Indeno(1,2,3-cd)pyrene	100	43 J	58 J	NA	NA		NA	43 J
Naphthalene	110			NA	NA		NA	
Phenanthrene	1100	59 J	140 J	NA	NA		NA	240 J
Pyrene	880	110 J	220 J	NA	NA	64 J	NA	320 J
bis(2-Ethylhexyl)phthalate	7500			NA	NA	60 J	NA	1,900
Explosives (µg/kg)								
2,4-Dinitrotoluene								7,300 J
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose			2,600		4,700	75,000		4,800
Total Inorganics (mg/kg)								
Aluminum	9,000	4,430	4,380	8,250	9,850	7,370	10,300	4,310
Antimony								2.9 J
Arsenic	5.2	13.4	6.7	11.4	5.9	8.3	32	12.6
Barium	47.6	34 J	23.6 J	53.2	28.6 J	50.4 J	55.8	213
Beryllium	1.1	0.47 J	0.19 J	0.51 J	0.25 J	0.44 J		0.24 J
Cadmium	2.5	0.2 J	0.25 J	0.38 J		0.36 J		5.3
Calcium	573	1,590	99,000	453 J	181 J	2,640	948 J	2,020
Chromium	15.9	16.6	12.6	13.9	13.1	14.9	12.6	20.6
Cobalt	7.5	9.5 J	4.1 J	13.6	2.5 J	5.7 J	14.4	9.7 J
Copper	8	18.2	10.9	12.4	8.6	27.8	14.8	182
Cyanide	0.73							
Iron	16,000	11,800	8,300	10,100	15,700	12,800	10,100	17,200
Lead	21.7	20.8	21.5	64	23.6	120	38.9	2,330
Magnesium	722	5,810	7,320	638 J	404 J	1,030 J	797 J	1,710
Manganese	388	130	123	229	23.6	195	151	205
Mercury	0.06	0.3	0.2	19	3.3	962	4.4	111
Nickel	6.6	76.7	21.9	7.1 J	4.5 J	7.5 J	26.7	28.4
Potassium	597	665 J	700 J	329 J	405 J	445 J	491 J	303 J
Selenium	0.62			1.1 L	1.2 L			
Silver	0.84	0.34 J		0.35 J	0.69 J	0.7 J	0.46 J	0.97 J
Sodium	120							272 J
Thallium	2.3			1 J	2.5 J		1.6 J	
Vanadium	26.7	21	13.8	36.6	30.9	30.7	30.1	22.1
Zinc	23.6	66.3	110	76.7	31.3	83.3	64.6	1,670
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	78,000	76,000	76,000	100,000	40,000
pH	6	NA	NA	7.1	6.3	5.8	6	7.2

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS02	IS53SS03	IS53SS04	IS53SS05	IS53SS06	IS53SS07	IS53SS08
Sample ID	**Background**	IS53SS020001	IS53SS030001	IS53SS040001	IS53SS050001	IS53SS060001	IS53SS070001	IS53SS080001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA	NA	NA		NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA	NA	NA		NA	NA	NA
2-Methylnaphthalene	73	NA	NA	NA		NA	NA	NA
Acenaphthene	140	NA	NA	NA		NA	NA	NA
Acenaphthylene		NA	NA	NA		NA	NA	NA
Acetophenone	64	NA	NA	NA		NA	NA	NA
Anthracene	260	NA	NA	NA		NA	NA	NA
Benzaldehyde	59	NA	NA	NA		NA	NA	NA
Benzo(a)anthracene	480	NA	NA	NA	54 J	NA	NA	NA
Benzo(a)pyrene	390	NA	NA	NA	46 J	NA	NA	NA
Benzo(b)fluoranthene	420	NA	NA	NA	63 J	NA	NA	NA
Benzo(g,h,i)perylene	130	NA	NA	NA		NA	NA	NA
Benzo(k)fluoranthene	360	NA	NA	NA		NA	NA	NA
Butylbenzylphthalate		NA	NA	NA		NA	NA	NA
Carbazole	130	NA	NA	NA		NA	NA	NA
Chrysene	440	NA	NA	NA	55 J	NA	NA	NA
Di-n-butylphthalate		NA	NA	NA	130 J	NA	NA	NA
Di-n-octylphthalate		NA	NA	NA		NA	NA	NA
Dibenz(a,h)anthracene		NA	NA	NA		NA	NA	NA
Dibenzofuran	65	NA	NA	NA		NA	NA	NA
Diethylphthalate		NA	NA	NA		NA	NA	NA
Dimethyl phthalate		NA	NA	NA		NA	NA	NA
Fluoranthene	1100	NA	NA	NA	110 J	NA	NA	NA
Fluorene	150	NA	NA	NA		NA	NA	NA
Indeno(1,2,3-cd)pyrene	100	NA	NA	NA		NA	NA	NA
Naphthalene	110	NA	NA	NA		NA	NA	NA
Phenanthrene	1100	NA	NA	NA	57 J	NA	NA	NA
Pyrene	880	NA	NA	NA	100 J	NA	NA	NA
bis(2-Ethylhexyl)phthalate	7500	NA	NA	NA	37 J	NA	NA	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene						2,135 J		
HMX								
Nitrocellulose				5,500		4,600	14,000	
Total Inorganics (mg/kg)								
Aluminum	9,000	5,290	4,680	2,990	4,490	4,150	3,190	3,160
Antimony			2.7 J			1.2 J	4 J	
Arsenic	5.2	13.1	20.1	17.1	3.5	12.2	7.7	2.3 J
Barium	47.6	55.5	221	163	32.6 J	42.2 J	43.8 J	34 J
Beryllium	1.1	0.34 J	0.48 J	0.24 J	0.31 J	0.39 J	0.33 J	0.16 J
Cadmium	2.5	1.1 J	11.7	5.1		4.1	0.54 J	
Calcium	573	947 J	3,010	387 J	994 J	2,210	1,540	396 J
Chromium	15.9	16.8	23.9	11.2	12.6	17.2	11.9	10.7
Cobalt	7.5	5.7 J	5.4 J	3.5 J	5.2 J	6.1 J	2.8 J	1.8 J
Copper	8	17.6	65.7	18.3	7.3	27.5	54.3	34.4
Cyanide	0.73							
Iron	16,000	17,700	16,300	4,480	9,530	15,100	7,550	6,900
Lead	21.7	1,230	5,860	6,630	24.2	332	273	63.9
Magnesium	722	666 J	1,050 J	319 J	859 J	424 J	331 J	607 J
Manganese	388	210	104	119	176	410	169	35.1
Mercury	0.06	111	637	18.2	0.3	13.5		1.7
Nickel	6.6	7.3 J	8.2 J	2.9 J	12.2	14.2	7.3 J	18.2
Potassium	597	358 J	505 J	180 J	336 J	157 J	143 J	185 J
Selenium	0.62			0.85 J		0.86 J		
Silver	0.84	0.52 J	0.81 J			1.7 J	0.98 J	0.74 J
Sodium	120	148 J	358 J	234 J		227 J		
Thallium	2.3							
Vanadium	26.7	24.8	27.6	16.8	17.4	21.6	20.8	14.3
Zinc	23.6	465	2,550	1,660	146	1,280	94.3	25.3
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	NA	NA	NA
pH	6	NA	NA	NA	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS09	IS53SS10	IS53SS11	IS53SS12	IS53SS13	IS53SS14	IS53SS15
Sample ID	**Background**	IS53SS090001	IS53SS100001	IS53SS110001	IS53SS120001	IS53SS130001	IS53SS140001	IS53SS150001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA		NA	NA	NA		NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA		NA	NA	NA		NA
2-Methylnaphthalene	73	NA		NA	NA	NA		NA
Acenaphthene	140	NA		NA	NA	NA	110 J	NA
Acenaphthylene		NA		NA	NA	NA		NA
Acetophenone	64	NA		NA	NA	NA	260 J	NA
Anthracene	260	NA	55 J*	NA	NA	NA	240 J	NA
Benzaldehyde	59	NA		NA	NA	NA	420 J	NA
Benzo(a)anthracene	480	NA	260 J*	NA	NA	NA	920	NA
Benzo(a)pyrene	390	NA	230 J*	NA	NA	NA	1,100	NA
Benzo(b)fluoranthene	420	NA	320 J*	NA	NA	NA	1,400	NA
Benzo(g,h,i)perylene	130	NA	84 J*	NA	NA	NA	320 J	NA
Benzo(k)fluoranthene	360	NA	150 J*	NA	NA	NA	650	NA
Butylbenzylphthalate		NA		NA	NA	NA	69 J	NA
Carbazole	130	NA	55 J*	NA	NA	NA	170 J	NA
Chrysene	440	NA	290 J*	NA	NA	NA	1,300	NA
Di-n-butylphthalate		NA	320 J	NA	NA	NA	51 J	NA
Di-n-octylphthalate		NA		NA	NA	NA		NA
Dibenz(a,h)anthracene		NA		NA	NA	NA		NA
Dibenzofuran	65	NA		NA	NA	NA	100 J	NA
Diethylphthalate		NA		NA	NA	NA		NA
Dimethyl phthalate		NA		NA	NA	NA	450 J	NA
Fluoranthene	1100	NA	600 *	NA	NA	NA	2,800	NA
Fluorene	150	NA		NA	NA	NA	160 J	NA
Indeno(1,2,3-cd)pyrene	100	NA	82 J	NA	NA	NA	320 J	NA
Naphthalene	110	NA		NA	NA	NA	70 J	NA
Phenanthrene	1100	NA	310 J*	NA	NA	NA	2,100	NA
Pyrene	880	NA	500 *	NA	NA	NA	2,300	NA
bis(2-Ethylhexyl)phthalate	7500	NA	57 J	NA	NA	NA	1,200	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene			760 J					
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose				5,700		4,200		7,200
Total Inorganics (mg/kg)								
Aluminum	9,000	4,900	2,110 *	2,170	1,910	3,540	2,320	2,420
Antimony								1.3 J
Arsenic	5.2	7.2	8.3 *	12.2	13.7	7.1	39.6	21.6
Barium	47.6	45.3 J	47.4 *	71.7	59.8	41.8 J	54.7 J	65.4
Beryllium	1.1	0.32 J	0.32 J*	0.43 J	0.36 J	0.33 J	0.42 J	0.38 J
Cadmium	2.5	0.14 J	0.52 J*	0.48 J	0.31 J	0.25 J	15.7	3.4
Calcium	573	1,090 J	2,130 *	921 J	1,280	1,490	1,750	968 J
Chromium	15.9	10.4	10.7 *	6.6	7.3	8.1	11.6	13.7
Cobalt	7.5	8.4 J	5.1 J*	4.2 J	6.1 J	2.9 J	3.8 J	3 J
Copper	8	33	18.7 *	20.3	22.2	9.9	33.3	73.8
Cyanide	0.73							
Iron	16,000	7,750	5,050 *	4,910	4,980	7,650	5,560	6,170
Lead	21.7	52.1	952 *	1,000	1,050	213	463	481
Magnesium	722	281 J	1,270 *	198 J	233 J	402 J	300 J	314 J
Manganese	388	102	150 *	18.3	122	95.3	155	263
Mercury	0.06	2.7	44.7	2	9.3	7.3	17.1	40.6
Nickel	6.6	8.4 J	25.7 *	6.2 J	7.4 J	5.7 J	8 J	12.1
Potassium	597	149 J	233 J*	163 J	181 J	238 J	124 J	129 J
Selenium	0.62			1.3 J		0.89 J		
Silver	0.84	3.1				0.46 J	0.9 J	0.38 J
Sodium	120	70.6 J					122 J	64.1 J
Thallium	2.3				0.94 J	1.5 J		
Vanadium	26.7	18.2	17.7 *	33.6	21.6	19.9	17.7	17.7
Zinc	23.6	117	210 *	190	211	91.9	219	234
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	150,000 *	NA	NA	NA	NA	NA
pH	6	NA	7 *	NA	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS16	IS53SS17	IS53SS18	IS53SS19	IS53SS20	IS53SS21	IS53SS22
Sample ID	**Background**	IS53SS160001	IS53SS170001	IS53SS180001	IS53SS190001	IS53SS200001	IS53SS210001	IS53SS220001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene			NA	NA	NA		NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl			NA	NA	NA	58 J	NA	NA
2-Methylnaphthalene	73		NA	NA	NA	140 J	NA	NA
Acenaphthene	140		NA	NA	NA	1,200	NA	NA
Acenaphthylene			NA	NA	NA		NA	NA
Acetophenone	64		NA	NA	NA		NA	NA
Anthracene	260		NA	NA	NA	2,900	NA	NA
Benzaldehyde	59		NA	NA	NA		NA	NA
Benzo(a)anthracene	480	140 J	NA	NA	NA	7,700	NA	NA
Benzo(a)pyrene	390	130 J	NA	NA	NA	6,300	NA	NA
Benzo(b)fluoranthene	420	190 J	NA	NA	NA	9,100	NA	NA
Benzo(g,h,i)perylene	130	41 J	NA	NA	NA	1,700	NA	NA
Benzo(k)fluoranthene	360	91 J	NA	NA	NA	2,800	NA	NA
Butylbenzylphthalate			NA	NA	NA	110 J*	NA	NA
Carbazole	130		NA	NA	NA	1,600	NA	NA
Chrysene	440	160 J	NA	NA	NA	7,900 D	NA	NA
Di-n-butylphthalate			NA	NA	NA	240 J*	NA	NA
Di-n-octylphthalate			NA	NA	NA		NA	NA
Dibenz(a,h)anthracene			NA	NA	NA	220 J	NA	NA
Dibenzofuran	65		NA	NA	NA	600	NA	NA
Diethylphthalate			NA	NA	NA	110 J	NA	NA
Dimethyl phthalate			NA	NA	NA		NA	NA
Fluoranthene	1100	400 J	NA	NA	NA	17,000	NA	NA
Fluorene	150		NA	NA	NA	1,100	NA	NA
Indeno(1,2,3-cd)pyrene	100	44 J	NA	NA	NA	1,900	NA	NA
Naphthalene	110		NA	NA	NA	350 J	NA	NA
Phenanthrene	1100	230 J	NA	NA	NA	13,000	NA	NA
Pyrene	880	310 J	NA	NA	NA	14,000	NA	NA
bis(2-Ethylhexyl)phthalate	7500		NA	NA	NA	360 J*	NA	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose								
Total Inorganics (mg/kg)								
Aluminum	9,000	3,850	797	4,450	1,990	6,120 *	4,630	4,940
Antimony		0.91 J						0.8 J
Arsenic	5.2	6.8	2.7	2.1 J	2.8	5.7	10.9	4.3
Barium	47.6	33.3 J	13.9 J	33.8 J	32.9 J	32.7 J*	41.3 J	55.2
Beryllium	1.1	0.33 J	0.13 J	0.23 J	0.24 J	0.37 J*	0.44 J	0.37 J
Cadmium	2.5	0.44 J			0.43 J	2.3 *		0.24 J
Calcium	573	3,680	998 J	1,490	1,210	2,760 *	3,150	4,710
Chromium	15.9	10.1	3.6	13.2	11.4	24.2 *	12.9	16.3
Cobalt	7.5	2.6 J	1.2 J	1.9 J	5.5 J	6.4 J*	3.6 J	4.6 J
Copper	8	10.1	18.2	7.6	10.6	24.4 *	17	68.1
Cyanide	0.73							
Iron	16,000	9,670	2,080	6,090	2,590	11,200 *	9,270	9,500
Lead	21.7	68.5	92.7	18.9	157	192 *	76.1	192
Magnesium	722	1,640	386 J	584 J	249 J	2,090 *	1,020 J	2,280
Manganese	388	95.2	37.5	110	62.7	195 *	137	241
Mercury	0.06	3.7	0.29	0.76	2	2 *		0.78
Nickel	6.6	5.4 J	10.4	9.8	3.7 J	26.3 *	11.7	7.6 J
Potassium	597	213 J	114 J	371 J	138 J	330 J*	207 J	334 J
Selenium	0.62							
Silver	0.84	0.55 J				0.42 J*		0.4 J
Sodium	120			72.8 J		539 J*	104 J	
Thallium	2.3					1 J*		
Vanadium	26.7	22	13	10.9 J	11.7 J	37 *	25.7	26.9
Zinc	23.6	40.1	55.4	38.9	100	149 *	78.4	126
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	33,000	NA	NA	NA	NA	NA	NA
pH	6	7.06	NA	NA	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS23	IS53SS24	IS53SS25	IS53SS26	IS53SS27	IS53SS28	IS53SS29
Sample ID	**Background**	IS53SS230001	IS53SS240001	IS53SS250001	IS53SS260001	IS53SS270001	IS53SS280001	IS53SS290001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA		NA	NA	NA		NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA		NA	NA	NA		NA
2-Methylnaphthalene	73	NA		NA	NA	NA		NA
Acenaphthene	140	NA		NA	NA	NA		NA
Acenaphthylene		NA		NA	NA	NA		NA
Acetophenone	64	NA		NA	NA	NA		NA
Anthracene	260	NA		NA	NA	NA		NA
Benzaldehyde	59	NA		NA	NA	NA		NA
Benzo(a)anthracene	480	NA	91 J	NA	NA	NA	170 J	NA
Benzo(a)pyrene	390	NA	89 J	NA	NA	NA	160 J	NA
Benzo(b)fluoranthene	420	NA	130 J	NA	NA	NA	180 J	NA
Benzo(g,h,i)perylene	130	NA		NA	NA	NA	70 J	NA
Benzo(k)fluoranthene	360	NA	89 J	NA	NA	NA	96 J	NA
Butylbenzylphthalate		NA	81 J	NA	NA	NA	190 J	NA
Carbazole	130	NA		NA	NA	NA		NA
Chrysene	440	NA	100 J	NA	NA	NA	200 J	NA
Di-n-butylphthalate		NA	170 J	NA	NA	NA	250 J	NA
Di-n-octylphthalate		NA		NA	NA	NA		NA
Dibenz(a,h)anthracene		NA		NA	NA	NA		NA
Dibenzofuran	65	NA		NA	NA	NA		NA
Diethylphthalate		NA		NA	NA	NA		NA
Dimethyl phthalate		NA		NA	NA	NA	200 J	NA
Fluoranthene	1100	NA	140 J	NA	NA	NA	270 J	NA
Fluorene	150	NA		NA	NA	NA		NA
Indeno(1,2,3-cd)pyrene	100	NA	43 J	NA	NA	NA	66 J	NA
Naphthalene	110	NA		NA	NA	NA		NA
Phenanthrene	1100	NA	68 J	NA	NA	NA	150 J	NA
Pyrene	880	NA	220 J	NA	NA	NA	360 J	NA
bis(2-Ethylhexyl)phthalate	7500	NA	140 J	NA	NA	NA	160 J	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose								
Total Inorganics (mg/kg)								
Aluminum	9,000	8,330	5,480	4,060	4,420	12,000	6,470	11,900
Antimony				1.1 J	8.3 J*		17.8	
Arsenic	5.2	4	5.4	13.8	66.1 *	5.9	10.1	6
Barium	47.6	46.6	50.4	124	308 *	62.7	131	58.6
Beryllium	1.1	0.39 J	0.34 J	0.25 J	0.39 J*	0.43 J	0.39 J	0.42 J
Cadmium	2.5		6.8	2.1	31.2 *	0.78 J	1.9	0.31 J
Calcium	573	1,560	12,800	7,310	9,490 *	3,740	3,150	1,590
Chromium	15.9	13.1	17.9	55.2	124 *	33.4	41	19.7
Cobalt	7.5	4.2 J	17.7	8.9 J	13.3 J*	6.2 J	8.4 J	5.5 J
Copper	8	5.9	24.6	23.9	674 *	19.3	27.8	68.8
Cyanide	0.73				1.4		0.64	
Iron	16,000	13,300	12,400	7,850	32,600 *	16,900	12,600	15,200
Lead	21.7	14.9	493	2,100	31,200 *	427	786	109
Magnesium	722	518 J	3,940	5,120	1,650 *	1,800	1,340	918 J
Manganese	388	142	271	141	380 *	259	188	127
Mercury	0.06	0.12	3.4	3.5	21.6 *	1.7	13.6	2.5
Nickel	6.6	3.7 J	45.6	34.4	21.6	8.8 J	16.5	8.7 J
Potassium	597	290 J	300 J	162 J	441 J*	571 J	425 J	709 J
Selenium	0.62				1.2 J*			
Silver	0.84		0.77 J	0.55 J	2 J*		3.5	0.41 J
Sodium	120		503 J	244 J	1,470 *	208 J	146 J	63.3 J
Thallium	2.3							
Vanadium	26.7	24.4	33.5	18	29.3 *	30	26.1	27.7
Zinc	23.6	34.7	604	1,590	6,000 *	1,080	808	184
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	27,000	NA	NA	NA	NA	NA
pH	6	NA	8.7	NA	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS30	IS53SS31	IS53SS32	IS53SS33	IS53SS34	IS53SS35	IS53SS36
Sample ID	**Background**	IS53SS300001	IS53SS310001	IS53SS320001	IS53SS330001	IS53SS340001	IS53SS35P0001	IS53SS360001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA	NA	NA	NA	NA	4.4 J*	
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA	NA	NA	NA	NA		
2-Methylnaphthalene	73	NA	NA	NA	NA	NA		
Acenaphthene	140	NA	NA	NA	NA	NA		
Acenaphthylene		NA	NA	NA	NA	NA		53 J
Acetophenone	64	NA	NA	NA	NA	NA		100 J
Anthracene	260	NA	NA	NA	NA	NA		53 J
Benzaldehyde	59	NA	NA	NA	NA	NA		
Benzo(a)anthracene	480	NA	NA	NA	NA	NA	270 J*	300 J
Benzo(a)pyrene	390	NA	NA	NA	NA	NA	250 J*	320 J
Benzo(b)fluoranthene	420	NA	NA	NA	NA	NA	350 J*	460
Benzo(g,h,i)perylene	130	NA	NA	NA	NA	NA	87 J*	110 J
Benzo(k)fluoranthene	360	NA	NA	NA	NA	NA	210 J*	220 J
Butylbenzylphthalate		NA	NA	NA	NA	NA	60 J*	620
Carbazole	130	NA	NA	NA	NA	NA		
Chrysene	440	NA	NA	NA	NA	NA	260 J*	390 J
Di-n-butylphthalate		NA	NA	NA	NA	NA	9,700 *	270 J
Di-n-octylphthalate		NA	NA	NA	NA	NA		
Dibenz(a,h)anthracene		NA	NA	NA	NA	NA		
Dibenzofuran	65	NA	NA	NA	NA	NA		
Diethylphthalate		NA	NA	NA	NA	NA	210 J*	
Dimethyl phthalate		NA	NA	NA	NA	NA		
Fluoranthene	1100	NA	NA	NA	NA	NA	410 *	580
Fluorene	150	NA	NA	NA	NA	NA		
Indeno(1,2,3-cd)pyrene	100	NA	NA	NA	NA	NA	85 J*	110 J
Naphthalene	110	NA	NA	NA	NA	NA		
Phenanthrene	1100	NA	NA	NA	NA	NA	88 J*	220 J
Pyrene	880	NA	NA	NA	NA	NA	610 *	590
bis(2-Ethylhexyl)phthalate	7500	NA	NA	NA	NA	NA	1,600 *	630
Explosives (µg/kg)								
2,4-Dinitrotoluene							130 J	
2-Amino-4,6-dinitrotoluene								
HMX					268,364 J			
Nitrocellulose			3,400	5,700		15,000	14,000	
Total Inorganics (mg/kg)								
Aluminum	9,000	7,400	6,870	8,960	8,270	7,000	7,340 *	5,280
Antimony			1.9 J	3.1 J	2.3 J	1.3 J	2.2 J	1.6 J
Arsenic	5.2	8.8	29.8	63.1	42.4	8.1	9.6 *	8.4
Barium	47.6	68.4	52.3 J	112	76.6	99.7	44 *	46.8
Beryllium	1.1	0.49 J	0.47 J	0.63 J	0.61 J	0.6 J	0.49 J*	0.47 J
Cadmium	2.5	0.73 J	0.59 J	16.2	2.4	2.6	1.3 *	0.73 J
Calcium	573	1,810	1,750	4,730	2,840	2,760	69,400	2,130
Chromium	15.9	15.6	17.9	36.6	25.4	17.6	58.4 *	15.4
Cobalt	7.5	7.3 J	6.6 J	10.6 J	9 J	6.8 J	12 *	5.1 J
Copper	8	65.6	27.7	123	339	70.2	59.5 *	60.7
Cyanide	0.73							
Iron	16,000	11,800	21,700	18,800	19,900	14,100	13,500 *	9,380
Lead	21.7	142	195	387	1,190	445	195 *	187
Magnesium	722	723 J	1,080 J	1,160 J	856 J	1,030 J	7,770	809 J
Manganese	388	408	231	492	467	429	306 *	231
Mercury	0.06	21.4	43.6	177	52.3	66.8	36.5 *	53.9
Nickel	6.6	15.9	6.3 J	19.3	11.3	10.9	69 *	12.7
Potassium	597	407 J	445 J	745 J	615 J	503 J	614 J*	378 J
Selenium	0.62			1.1 J				
Silver	0.84	0.83 J	0.9 J	1.6 J	1.9 J	19.6	4.6	0.86 J
Sodium	120	90.6 J		130 J	159 J		110 J*	67.1 J
Thallium	2.3				1 J			
Vanadium	26.7	27.8	23.3	32	33.3	23.4	31.7 *	24
Zinc	23.6	230	448	835	1,310	231	464 *	371
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	NA	38,000 *	NA
pH	6	NA	NA	NA	NA	NA	8.6 *	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS37	IS53SS38	IS53SS39	IS53SS40	IS53SS41	IS53SS42	IS53SS43
Sample ID	**Background**	IS53SS370001	IS53SS380001	IS53SS390001	IS53SS400001	IS53SS410001	IS53SS420001	IS53SS430001
	95% UCL	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/02/01	05/02/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA	NA		NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA	NA		NA	NA	NA	NA
2-Methylnaphthalene	73	NA	NA		NA	NA	NA	NA
Acenaphthene	140	NA	NA		NA	NA	NA	NA
Acenaphthylene		NA	NA		NA	NA	NA	NA
Acetophenone	64	NA	NA	46 J	NA	NA	NA	NA
Anthracene	260	NA	NA	160 J	NA	NA	NA	NA
Benzaldehyde	59	NA	NA		NA	NA	NA	NA
Benzo(a)anthracene	480	NA	NA	1,500	NA	NA	NA	NA
Benzo(a)pyrene	390	NA	NA	1,100	NA	NA	NA	NA
Benzo(b)fluoranthene	420	NA	NA	1,800	NA	NA	NA	NA
Benzo(g,h,i)perylene	130	NA	NA	250 J	NA	NA	NA	NA
Benzo(k)fluoranthene	360	NA	NA	950	NA	NA	NA	NA
Butylbenzylphthalate		NA	NA	210 J	NA	NA	NA	NA
Carbazole	130	NA	NA	130 J	NA	NA	NA	NA
Chrysene	440	NA	NA	1,600	NA	NA	NA	NA
Di-n-butylphthalate		NA	NA	59 J	NA	NA	NA	NA
Di-n-octylphthalate		NA	NA		NA	NA	NA	NA
Dibenz(a,h)anthracene		NA	NA		NA	NA	NA	NA
Dibenzofuran	65	NA	NA		NA	NA	NA	NA
Diethylphthalate		NA	NA	46 J	NA	NA	NA	NA
Dimethyl phthalate		NA	NA		NA	NA	NA	NA
Fluoranthene	1100	NA	NA	2,500	NA	NA	NA	NA
Fluorene	150	NA	NA		NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	100	NA	NA	300 J	NA	NA	NA	NA
Naphthalene	110	NA	NA		NA	NA	NA	NA
Phenanthrene	1100	NA	NA	740	NA	NA	NA	NA
Pyrene	880	NA	NA	2,600	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	7500	NA	NA	340 J	NA	NA	NA	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose		4,700						
Total Inorganics (mg/kg)								
Aluminum	9,000	3,470	6,020	3,230	6,640	3,480	2,420	7,890
Antimony		1.1 J	1.9 J	4.4 J		1.6 J*		
Arsenic	5.2	8.7	7.5	3.3	6.5	4.7	1.2 J	7.3
Barium	47.6	40.2 J	109	30.3 J	59.9	32.4 J	16.3 J	44.2 J
Beryllium	1.1	0.29 J	0.46 J	0.34 J	0.57 J	0.33 J	0.1 J	0.32 J
Cadmium	2.5	1.6	0.8 J	1.3	0.11 J	0.82 J*	0.22 J	2.6
Calcium	573	1,500	2,560	2,020	2,000	6,260 *	16,000	7,210
Chromium	15.9	19.1	15.4	11.2	12.4	18.8 *	18.1	14.7
Cobalt	7.5	2.6 J	2.9 J	2.3 J	4 J	3.9 J	3.1 J	3.3 J
Copper	8	37	62.6	14.7	14.8	36.8	12.2	55.4
Cyanide	0.73							
Iron	16,000	7,230	12,200	6,610	13,700	6,880	5,130	14,900
Lead	21.7	207	471	620	120	508 *	157	187
Magnesium	722	613 J	618 J	516 J	611 J	2,900 *	9,300	1,300
Manganese	388	88.4	118	76.9	131	165	65.4	254
Mercury	0.06	51.3 L	4.7 L	2.3 L	0.8 L	5.9 L	0.09 R	0.17 L
Nickel	6.6	7.6 J	7.1 J	6.1 J	8 J	16.1	25	10.7
Potassium	597	276 J	256 J	176 J	324 J	499 J	551 J	374 J
Selenium	0.62			0.83 J				
Silver	0.84	3		0.52 J	0.38 J	0.38 J		
Sodium	120	96.8 J		84.7 J		79.7 J	136 J	132 J
Thallium	2.3							1.1 J
Vanadium	26.7	15.7	24.1	15.5	28.3	16.2	26.3	30
Zinc	23.6	497	410	207	138	457 *	111	941
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	38,000	NA	NA	NA	NA
pH	6	NA	NA	7.3	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS44	IS53SS45	IS53SS46	IS53SS47	IS53SS48	IS53SS49	IS53SS50	IS53SS51
Sample ID	**Background**	IS53SS440001	IS53SS450001	IS53SS460001	IS53SS470001	IS53SS480001	IS53SS490001	IS53SS500001	IS53SS510001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Constituent Name									
Volatile Organic Compounds (µg/kg)									
Tetrachloroethene			NA	NA	NA	NA		NA	NA
Semi-volatile Organic Compounds (µg/kg)									
1,1-Biphenyl			NA	NA	NA	NA		NA	NA
2-Methylnaphthalene	73		NA	NA	NA	NA		NA	NA
Acenaphthene	140		NA	NA	NA	NA		NA	NA
Acenaphthylene			NA	NA	NA	NA		NA	NA
Acetophenone	64		NA	NA	NA	NA		NA	NA
Anthracene	260		NA	NA	NA	NA		NA	NA
Benzaldehyde	59		NA	NA	NA	NA		NA	NA
Benzo(a)anthracene	480		NA	NA	NA	NA	170 J	NA	NA
Benzo(a)pyrene	390		NA	NA	NA	NA	150 J	NA	NA
Benzo(b)fluoranthene	420		NA	NA	NA	NA	220 J	NA	NA
Benzo(g,h,i)perylene	130		NA	NA	NA	NA	49 J	NA	NA
Benzo(k)fluoranthene	360		NA	NA	NA	NA	99 J	NA	NA
Butylbenzylphthalate			NA	NA	NA	NA	42 J	NA	NA
Carbazole	130		NA	NA	NA	NA		NA	NA
Chrysene	440		NA	NA	NA	NA	170 J	NA	NA
Di-n-butylphthalate			NA	NA	NA	NA	88 J	NA	NA
Di-n-octylphthalate			NA	NA	NA	NA		NA	NA
Dibenz(a,h)anthracene			NA	NA	NA	NA		NA	NA
Dibenzofuran	65		NA	NA	NA	NA		NA	NA
Diethylphthalate		43 J	NA	NA	NA	NA		NA	NA
Dimethyl phthalate			NA	NA	NA	NA		NA	NA
Fluoranthene	1100		NA	NA	NA	NA	280 J	NA	NA
Fluorene	150		NA	NA	NA	NA		NA	NA
Indeno(1,2,3-cd)pyrene	100		NA	NA	NA	NA	57 J	NA	NA
Naphthalene	110		NA	NA	NA	NA		NA	NA
Phenanthrene	1100		NA	NA	NA	NA	110 J	NA	NA
Pyrene	880		NA	NA	NA	NA	280 J	NA	NA
bis(2-Ethylhexyl)phthalate	7500	45 J	NA	NA	NA	NA	120 J	NA	NA
Explosives (µg/kg)									
2,4-Dinitrotoluene									
2-Amino-4,6-dinitrotoluene									
HMX									
Nitrocellulose						5,900		3,000	
Total Inorganics (mg/kg)									
Aluminum	9,000	4,690	8,780	5,380	4,140	5,190	5,220	6,580	6,520
Antimony		0.8 J	0.87 J	2.7 J		1.6 J	4.6 J	1.2 J	
Arsenic	5.2	3.8	4.4	4.2	2.2	4.3	3.4	6.6	4.7
Barium	47.6	71.7	63.3	40.4 J	33.4 J	73.8	39.7 J	54.1	44.4
Beryllium	1.1	0.23 J	0.44 J	0.37 J	0.24 J	0.41 J	0.27 J	0.39 J	0.35 J
Cadmium	2.5	0.51 J	0.34 J	1.7	0.24 J	1.2	0.7 J	1.1 J	0.11 J
Calcium	573	1,280	2,120	3,320	1,450	2,160	2,590	1,890	5,030
Chromium	15.9	12.7	16.5	18.5	8.1	19.6	34	14.9	15.6
Cobalt	7.5	1.8 J	6.5 J	3.8 J	3.1 J	7.4 J	3.1 J	4.1 J	3.8 J
Copper	8	27	54.1	4,000	43	264	545	30.7	26.4
Cyanide	0.73								
Iron	16,000	9,860	13,200	11,200	6,860	10,200	14,500	14,200	11,500
Lead	21.7	530	75	254	40.7	177	161	86	60.3
Magnesium	722	361 J	756 J	596 J	391 J	697 J	595 J	601 J	2,770
Manganese	388	62.8	243	195	138	307	107	166	159
Mercury	0.06	1.1 L	22.1 L	5.8 L	0.62 L	577 L	120 L	11.6 L	0.65 L
Nickel	6.6	4.1 J	7.8 J	8.4 J	4.2 J	8.5	9.4	8.6 J	13.6
Potassium	597	216 J	489 J	328 J	240 J	363 J	319 J	383 J	927 J
Selenium	0.62								
Silver	0.84	0.62 J	0.99 J	1.4 J	0.45 J	1.5 J	0.82 J	0.78 J	
Sodium	120			67.5 J			60.7 J		
Thallium	2.3							1.3 J	
Vanadium	26.7	18	26.4	21.6	13.2	20.6	18.2	26.7	19.8
Zinc	23.6	141	141	604	102	197	365	170	87.8
Wet Chemistry (mg/kg)									
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	NA	15,000	NA	NA
pH	6	NA	NA	NA	NA	NA	7.7	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS52	IS53SS53	IS53SS54	IS53SS55	IS53SS56	IS53SS57	IS53SS58	IS53SS59
Sample ID	**Background**	IS53SS520001	IS53SS530001	IS53SS540001	IS53SS550001	IS53SS560001	IS53SS570001	IS53SS580001	IS53SS590001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Constituent Name									
Volatile Organic Compounds (µg/kg)									
Tetrachloroethene		NA	NA	NA	NA	7.3 J	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)									
1,1-Biphenyl		NA	NA	NA	NA		NA	NA	NA
2-Methylnaphthalene	73	NA	NA	NA	NA		NA	NA	NA
Acenaphthene	140	NA	NA	NA	NA		NA	NA	NA
Acenaphthylene		NA	NA	NA	NA		NA	NA	NA
Acetophenone	64	NA	NA	NA	NA		NA	NA	NA
Anthracene	260	NA	NA	NA	NA		NA	NA	NA
Benzaldehyde	59	NA	NA	NA	NA		NA	NA	NA
Benzo(a)anthracene	480	NA	NA	NA	NA		NA	NA	NA
Benzo(a)pyrene	390	NA	NA	NA	NA		NA	NA	NA
Benzo(b)fluoranthene	420	NA	NA	NA	NA		NA	NA	NA
Benzo(g,h,i)perylene	130	NA	NA	NA	NA		NA	NA	NA
Benzo(k)fluoranthene	360	NA	NA	NA	NA		NA	NA	NA
Butylbenzylphthalate		NA	NA	NA	NA		NA	NA	NA
Carbazole	130	NA	NA	NA	NA		NA	NA	NA
Chrysene	440	NA	NA	NA	NA		NA	NA	NA
Di-n-butylphthalate		NA	NA	NA	NA	100 J	NA	NA	NA
Di-n-octylphthalate		NA	NA	NA	NA		NA	NA	NA
Dibenz(a,h)anthracene		NA	NA	NA	NA		NA	NA	NA
Dibenzofuran	65	NA	NA	NA	NA		NA	NA	NA
Diethylphthalate		NA	NA	NA	NA		NA	NA	NA
Dimethyl phthalate		NA	NA	NA	NA		NA	NA	NA
Fluoranthene	1100	NA	NA	NA	NA		NA	NA	NA
Fluorene	150	NA	NA	NA	NA		NA	NA	NA
Indeno(1,2,3-cd)pyrene	100	NA	NA	NA	NA		NA	NA	NA
Naphthalene	110	NA	NA	NA	NA		NA	NA	NA
Phenanthrene	1100	NA	NA	NA	NA		NA	NA	NA
Pyrene	880	NA	NA	NA	NA		NA	NA	NA
bis(2-Ethylhexyl)phthalate	7500	NA	NA	NA	NA	45 J	NA	NA	NA
Explosives (µg/kg)									
2,4-Dinitrotoluene									
2-Amino-4,6-dinitrotoluene									
HMX									
Nitrocellulose									
Total Inorganics (mg/kg)									
Aluminum	9,000	10,000	8,220	6,060	7,550	5,490	7,910	4,490	5,300
Antimony					0.73 J	1.4 J	5.2 J		
Arsenic	5.2	6.4	5.3	3.2	6.7	6.2	22.5	5	3.8
Barium	47.6	42.3 J	46.9	24.4 J	51.4	139	799	44.8 J	39 J
Beryllium	1.1	0.39 J	0.33 J	0.24 J	0.38 J	0.52 B	0.35 B	0.3 B	0.32 B
Cadmium	2.5				0.42 J	3.8	5.8	0.15 J	
Calcium	573	2,710	1,960	1,040 J	2,860	755 J	4,150	1,590	2,510
Chromium	15.9	18.7	15.6	11.8	18.2	19.7	90.8	11.1	10
Cobalt	7.5	3.4 J	3.4 J	1.4 J	5.8 J	8.3 J	8.2 J	2.6 J	2.2 J
Copper	8	18.6	14.5	88.9	34.3	364 J	27.1 J	8.8 J	7.1 J
Cyanide	0.73						0.83		
Iron	16,000	21,900	22,300	11,800	16,200	9,470	14,500	8,680	9,080
Lead	21.7	33.7	21.5	34.1	101	539	14,100	73.4	22.2
Magnesium	722	777 J	670 J	288 J	1,250	748 J	2,040	310 J	507 J
Manganese	388	103	94	51	295	646	332	143	65.8
Mercury	0.06	2.1 L	0.83 L	0.36 L	0.48 L		0.37 K	0.2 K	
Nickel	6.6	24.5	2.9 J	1.7 J	16.2	13.7	20.2	4.2 J	6.6 J
Potassium	597	695 J	554 J	270 J	730 J	341 J	830 J	433 J	534 J
Selenium	0.62		0.97 J				0.89 J		
Silver	0.84	0.46 J	0.3 J	0.39 J	0.3 J	1.4 J	1 J		
Sodium	120			310 J		63.7 J	811 J		
Thallium	2.3	1.4 J	1.6 J				1.1 J		
Vanadium	26.7	32.6	28.6	22	35.4	16.6	38.2	19.5	16.1
Zinc	23.6	69.2	112	28.9	106	541	4,040	48.2	40.3
Wet Chemistry (mg/kg)									
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	NA	NA	NA	NA
pH	6	NA	NA	NA	NA	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS60	IS53SS61	IS53SS62	IS53SS63	IS53SS64	IS53SS65	IS53SS66
Sample ID	**Background**	IS53SS600001	IS53SS610001	IS53SS620001	IS53SS630001	IS53SS640001	IS53SS650001	IS53SS660001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA		NA	NA	NA		NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA		NA	NA	NA		NA
2-Methylnaphthalene	73	NA		NA	NA	NA		NA
Acenaphthene	140	NA		NA	NA	NA		NA
Acenaphthylene		NA		NA	NA	NA		NA
Acetophenone	64	NA		NA	NA	NA		NA
Anthracene	260	NA		NA	NA	NA		NA
Benzaldehyde	59	NA		NA	NA	NA		NA
Benzo(a)anthracene	480	NA		NA	NA	NA	73 J	NA
Benzo(a)pyrene	390	NA		NA	NA	NA	66 J	NA
Benzo(b)fluoranthene	420	NA		NA	NA	NA	94 J	NA
Benzo(g,h,i)perylene	130	NA		NA	NA	NA	41 J	NA
Benzo(k)fluoranthene	360	NA		NA	NA	NA		NA
Butylbenzylphthalate		NA		NA	NA	NA		NA
Carbazole	130	NA		NA	NA	NA		NA
Chrysene	440	NA		NA	NA	NA	84 J	NA
Di-n-butylphthalate		NA		NA	NA	NA		NA
Di-n-octylphthalate		NA		NA	NA	NA		NA
Dibenz(a,h)anthracene		NA		NA	NA	NA		NA
Dibenzofuran	65	NA		NA	NA	NA		NA
Diethylphthalate		NA		NA	NA	NA		NA
Dimethyl phthalate		NA		NA	NA	NA		NA
Fluoranthene	1100	NA		NA	NA	NA	160 J	NA
Fluorene	150	NA		NA	NA	NA		NA
Indeno(1,2,3-cd)pyrene	100	NA		NA	NA	NA	41 J	NA
Naphthalene	110	NA		NA	NA	NA		NA
Phenanthrene	1100	NA		NA	NA	NA	94 J	NA
Pyrene	880	NA		NA	NA	NA	140 J	NA
bis(2-Ethylhexyl)phthalate	7500	NA		NA	NA	NA		NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose								
Total Inorganics (mg/kg)								
Aluminum	9,000	6,190	8,630	4,830	716	7,060	3,870	7,550
Antimony								
Arsenic	5.2	4.8	2	11.4	3.4	6.1	3.6	15.1
Barium	47.6	42.8 *	12.1 J	33.4 J	5.8 J	50	47.7	42.3 J
Beryllium	1.1	0.41 B*	0.34 B	0.32 B	0.12 B	0.47 B	0.38 B	0.39 B
Cadmium	2.5	0.1 J*		0.28 J	0.47 J			0.16 J
Calcium	573	1,040 J*	11,000	1,620	632 J	1,840	868 J	911 J
Chromium	15.9	14.7	17	10.7	3.5	14.3	10.1	13.6 *
Cobalt	7.5	4.6 J	7.9 J	3.8 J	0.92 J	6 J	4.4 J	3.2 J
Copper	8	16.5 J*	64.2 J	23.5 J	8.7 J	18.8 J	7.6 J	14.1 J*
Cyanide	0.73							
Iron	16,000	14,600	8,400	9,920	4,260	13,000	7,160	15,700 *
Lead	21.7	38	4.5	58.7	31	132	32.6	27.9
Magnesium	722	586 J	6,510	963 J	116 J	2,440	436 J	601 J
Manganese	388	270	147	132	59.7	70.9	382	74.9
Mercury	0.06		0.94 K	1.9 K	4 K	358 K	0.46 K	0.25 K
Nickel	6.6	5.2 J*	27.7	12.8	4.2 J	26.4	6 J	7.5 J
Potassium	597	321 J	416 J	350 J	105 J	817 J	200 J	627 J
Selenium	0.62							0.93 J
Silver	0.84	0.38 J*		0.3 J	0.59 J	0.41 J		0.39 J
Sodium	120		686 J	79.1 J		133 J		
Thallium	2.3	0.98 J						1.5 J*
Vanadium	26.7	24.3	13.3	18.2		23.5	17.5	29.3
Zinc	23.6	172 *	47.7	190	91.8	97.3	31.5	101
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	67,000	NA	NA	NA	NA
pH	6	NA	NA	8	NA	NA	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS67	IS53SS68	IS53SS69	IS53SS70	IS53SS71	IS53SS72	IS53SS73
Sample ID	**Background**	IS53SS670001	IS53SS680001	IS53SS690001	IS53SS700001	IS53SS710001	IS53SS720001	IS53SS730001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Constituent Name								
Volatile Organic Compounds (µg/kg)								
Tetrachloroethene		NA	NA	NA	NA	3.8 J	NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl		NA	NA	NA	NA		NA	NA
2-Methylnaphthalene	73	NA	NA	NA	NA		NA	NA
Acenaphthene	140	NA	NA	NA	NA		NA	NA
Acenaphthylene		NA	NA	NA	NA		NA	NA
Acetophenone	64	NA	NA	NA	NA		NA	NA
Anthracene	260	NA	NA	NA	NA	100 J	NA	NA
Benzaldehyde	59	NA	NA	NA	NA	61 J	NA	NA
Benzo(a)anthracene	480	NA	NA	NA	NA	360 J	NA	NA
Benzo(a)pyrene	390	NA	NA	NA	NA	280 J	NA	NA
Benzo(b)fluoranthene	420	NA	NA	NA	NA	400 J	NA	NA
Benzo(g,h,i)perylene	130	NA	NA	NA	NA	130 J	NA	NA
Benzo(k)fluoranthene	360	NA	NA	NA	NA	130 J	NA	NA
Butylbenzylphthalate		NA	NA	NA	NA	900	NA	NA
Carbazole	130	NA	NA	NA	NA	63 J	NA	NA
Chrysene	440	NA	NA	NA	NA	350 J	NA	NA
Di-n-butylphthalate		NA	NA	NA	NA	95 J	NA	NA
Di-n-octylphthalate		NA	NA	NA	NA		NA	NA
Dibenz(a,h)anthracene		NA	NA	NA	NA		NA	NA
Dibenzofuran	65	NA	NA	NA	NA		NA	NA
Diethylphthalate		NA	NA	NA	NA		NA	NA
Dimethyl phthalate		NA	NA	NA	NA		NA	NA
Fluoranthene	1100	NA	NA	NA	NA	740	NA	NA
Fluorene	150	NA	NA	NA	NA		NA	NA
Indeno(1,2,3-cd)pyrene	100	NA	NA	NA	NA	150 J	NA	NA
Naphthalene	110	NA	NA	NA	NA		NA	NA
Phenanthrene	1100	NA	NA	NA	NA	550	NA	NA
Pyrene	880	NA	NA	NA	NA	670	NA	NA
bis(2-Ethylhexyl)phthalate	7500	NA	NA	NA	NA	600	NA	NA
Explosives (µg/kg)								
2,4-Dinitrotoluene								
2-Amino-4,6-dinitrotoluene								
HMX								
Nitrocellulose		3,500		39,000				
Total Inorganics (mg/kg)								
Aluminum	9,000	3,220	5,820	4,020	2,710	4,430	6,080	5,680
Antimony							1.4 J	
Arsenic	5.2	4.6	3.4	4.3	11	6.8	5.3	12.7
Barium	47.6	21.6 J	28.8 J	29.8 J	38.1 J	43.1 J	56	55.6
Beryllium	1.1	0.31 B	0.28 B	0.28 B	0.4 B	0.37 B	0.42 B	0.42 B
Cadmium	2.5			0.16 J	0.14 J	0.78 J	0.35 J	1.2
Calcium	573	481 J	426 J	2,010	2,230	2,190	1,050 J	1,520
Chromium	15.9	9.2	9.4	9.1	8.1	14.4	14.1	17.8
Cobalt	7.5	1.3 J	2.9 J	1.7 J	4.4 J	9.9 J	4 J	3.9 J
Copper	8	10.9 J	5.4 J	9.5 J	14.4 J	36.8 J	22.8 J	18.9 J
Cyanide	0.73							
Iron	16,000	5,520	9,530	8,660	6,630	10,400	12,700	12,100
Lead	21.7	51.1	14.2	56.9	30.9	255	108	184
Magnesium	722	243 J	480 J	299 J	1,100 J	541 J	569 J	670 J
Manganese	388	26.7	78.7	124	90.6	99.7	218	244
Mercury	0.06	35.6 K	9.3 K	9.9 K	1.2 K	12.9 K	0.4 K	1.2 K
Nickel	6.6	5 J	3 J	1.9 J	19.1	5.8 J	4.2 J	8.8 J
Potassium	597	156 J	334 J	218 J	163 J	338 J	352 J	377 J
Selenium	0.62							
Silver	0.84	0.34 J		0.33 J	0.56 J	0.48 J	0.52 J	0.6 J
Sodium	120							
Thallium	2.3							
Vanadium	26.7	25.2	17.7	19.7	13.8	20.9	23.6	25.4
Zinc	23.6	19.5	21.1	51.6	50.2	151	84.4	267
Wet Chemistry (mg/kg)								
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	72,000	NA	NA
pH	6	NA	NA	NA	NA	6.5	NA	NA

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA = Not analyzed

Table 3-2
Lab Area Surface Soil and Dry Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	**Base-Wide**	IS53SS74	IS53SS75	IS53SS76	IS53SS77	IS53SS78
Sample ID	**Background**	IS53SS740001	IS53SS750001	IS53SS760001	IS53SS770001	IS53SS780001
	95% UCL	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Constituent Name						
Volatile Organic Compounds (µg/kg)						
Tetrachloroethene		NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)						
1,1-Biphenyl		NA	NA	NA	NA	NA
2-Methylnaphthalene	73	NA	NA	NA	NA	NA
Acenaphthene	140	NA	NA	NA	NA	NA
Acenaphthylene		NA	NA	NA	NA	NA
Acetophenone	64	NA	NA	NA	NA	NA
Anthracene	260	NA	NA	NA	NA	NA
Benzaldehyde	59	NA	NA	NA	NA	NA
Benzo(a)anthracene	480	NA	NA	NA	NA	NA
Benzo(a)pyrene	390	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	420	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	130	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	360	NA	NA	NA	NA	NA
Butylbenzylphthalate		NA	NA	NA	NA	NA
Carbazole	130	NA	NA	NA	NA	NA
Chrysene	440	NA	NA	NA	NA	NA
Di-n-butylphthalate		NA	NA	NA	NA	NA
Di-n-octylphthalate		NA	NA	NA	NA	NA
Dibenz(a,h)anthracene		NA	NA	NA	NA	NA
Dibenzofuran	65	NA	NA	NA	NA	NA
Diethylphthalate		NA	NA	NA	NA	NA
Dimethyl phthalate		NA	NA	NA	NA	NA
Fluoranthene	1100	NA	NA	NA	NA	NA
Fluorene	150	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	100	NA	NA	NA	NA	NA
Naphthalene	110	NA	NA	NA	NA	NA
Phenanthrene	1100	NA	NA	NA	NA	NA
Pyrene	880	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	7500	NA	NA	NA	NA	NA
Explosives (µg/kg)						
2,4-Dinitrotoluene		1,200 J				
2-Amino-4,6-dinitrotoluene						
HMX						
Nitrocellulose		72,000 *	5,600	16,000		13,000
Total Inorganics (mg/kg)						
Aluminum	9,000	6,970	5,120	7,660	4,730	3,520
Antimony		1.5 L	2.4 L	0.87 L		
Arsenic	5.2	7.1	32.1	39.7	1.7 J	10
Barium	47.6	102 *	71	46.1	22.2 J	12.9 J
Beryllium	1.1	0.55 J*	0.33 J	0.35 J	0.14 J	0.25 J
Cadmium	2.5	2.1 *	1.5	0.33 J		
Calcium	573	614 J*	2,550	893 J	100 J	217 J
Chromium	15.9	26.1	25.9	17.9	8.6	8.3
Cobalt	7.5	9.7 J*	18.9	5.4 J	2.2 J	1.6 J
Copper	8	964 *	56.9	679	3.4 J	12.5
Cyanide	0.73					
Iron	16,000	12,700	11,700	13,600	7,490	8,090
Lead	21.7	727	400	322	8.3	337
Magnesium	722	1,100 J	598 J	597 J	348 J	376 J
Manganese	388	713 *	153	148	104	29.3
Mercury	0.06	274 *	157	55.4	0.13	0.51
Nickel	6.6	12.3	8.5 J	7.6 J	2 J	4.4 J
Potassium	597	369 J	287 J	436 J	180 J	337 J
Selenium	0.62		0.87 L	0.87 L		
Silver	0.84	2 J	4.3	1 J		0.51 J
Sodium	120			66.8 J		
Thallium	2.3		0.87 J	1.9 J		2 J
Vanadium	26.7	27.4	21.4	26.1	14.5	39.8
Zinc	23.6	392 *	347	509	17.1	107
Wet Chemistry (mg/kg)						
Total organic carbon (TOC)	16,800	NA	NA	NA	NA	140,000
pH	6	NA	NA	NA	NA	5

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for surface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram
B = Analyte also detected in associated blank
D = Diluted L = Biased Low
J = Estimated R = Rejected by Data Validator
K = Biased High NA = Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**	Chemical Disposal Pit	Manhole 472 (S061)		Manhole 473	
Station ID	**Background**	IS49SB01	IS49SB02	IS49SB03	IS49SB05	IS49SB06
Sample ID	**95% UCL for**	IS49SB010405	IS49SB020708	IS49SB030607	IS49SB050507	IS49SB060507
Sample Date	**Subsurface Soil**	05/15/01	05/08/01	05/08/01	05/08/01	05/08/01
Constituent Name						
Volatile Organic Compounds (µg/kg)						
Cumene		7.9 J				
Tetrachloroethene		54				
Trichloroethene		3.1 J				
Semi-volatile Organic Compounds (µg/kg)						
3- and 4-Methylphenol						
Benzo(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Butylbenzylphthalate						
Chrysene						
Di-n-butylphthalate			56 J			
Diethylphthalate		110 J				
Fluoranthene						
Indeno(1,2,3-cd)pyrene						
Pyrene		40 J				
bis(2-Ethylhexyl)phthalate	120	54 J			50 J	51 J
Explosives (µg/kg)						
4-Nitrotoluene						
Nitrocellulose		5,900				
Total Inorganics (mg/kg)						
Aluminum	20,400	9,720	10,600 *	3,080	11,100	3,870
Antimony	1.8				0.9 J	
Arsenic	9.8	25.1	4.1 *		3.9	
Barium	68	46.4 J	43.1 J	21.1 J	46 J	24.5 J
Beryllium	0.96	0.51 J	0.34 J*	0.17 J	0.49 J	0.26 J
Cadmium	0.14					
Calcium	479	1,740	1,360	64.7 J	1,510	719 J
Chromium	33.9	14.4	16.1 *	5.7	15.3	4.4
Cobalt	133	7 J	5.8 J	0.67 J	3.4 J	0.49 J
Copper	17.9	21.4	9.3 *	5.3 J	9.7	1.7 J
Cyanide	0.68					
Iron	45,400	17,300	17,600 *	3,660	16,500	3,360
Lead	17.4	25.2	13.2	7.2	14.8	7
Magnesium	1,220	720 J	774 J	237 J	621 J	323 J
Manganese	1,150	79.7	48	2.6 J	71.2	8.8
Mercury	0.18	0.53				
Nickel	18.2	5.9 J	2.9 J	0.57 J	3.9 J	0.59 J
Potassium	1,050	685 J	689 J*	249 J	538 J	213 J
Selenium	2.6	1.6	0.8 J			
Silver	2.2	0.37 J	0.73 J*		0.7 J	
Sodium	123			63.4 J		80.6 J
Thallium	5.5					
Vanadium	72.7	27.7	31.1		26.9	
Zinc	70.4	62.1	63.8 J	8.2 J	32.6 J	13.8 J

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**	Manhole 466 (S087)	Manhole 467 (S063)		Manhole 468 (S064)	Manhole 469 (S062)	
Station ID	**Background**	IS53SB01	IS53SB02	IS53SB03	IS53SB04	IS53SB06	IS53SB07
Sample ID	**95% UCL for**	IS53SB010608	IS53SB020204	IS53SB031416	IS53SB041112	IS53SB061214	IS53SB071415
Sample Date	**Subsurface Soil**	05/08/01	05/08/01	05/08/01	05/08/01	05/07/01	05/08/01
Constituent Name							
Volatile Organic Compounds (µg/kg)							
Cumene		NA	NA	NA	NA	NA	NA
Tetrachloroethene		NA	NA	NA	NA	NA	NA
Trichloroethene		NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)							
3- and 4-Methylphenol		NA	NA	NA	NA	NA	NA
Benzo(a)anthracene		NA	NA	NA	NA	NA	NA
Benzo(a)pyrene		NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene		NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene		NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene		NA	NA	NA	NA	NA	NA
Butylbenzylphthalate		NA	NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	NA
Di-n-butylphthalate		NA	NA	NA	NA	NA	NA
Diethylphthalate		NA	NA	NA	NA	NA	NA
Fluoranthene		NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene		NA	NA	NA	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	120	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)							
4-Nitrotoluene		NA	NA	NA	NA	NA	NA
Nitrocellulose		NA	NA	NA	NA	NA	NA
Total Inorganics (mg/kg)							
Aluminum	20,400	13,200 J	5,680 J	8,760 J	5,990 J	11,100 J	6,920 J
Antimony	1.8	1 J		1.1 J		1 J	
Arsenic	9.8	5.3	3.9	9.2	2.2 J	6.7	6.9
Barium	68	47.6 J	32.2 J	36.5 J	44.9 J	49.5 J	35.5 J
Beryllium	0.96	0.52 J	0.43 J	0.54 J	0.46 J	0.5 B*	0.66 J
Cadmium	0.14						
Calcium	479	1,750	1,200 J	1,650	1,170 J	2,160	71.5 J
Chromium	33.9	17.7	12	14.5	10.2	17.4	13.9
Cobalt	133	2.3 J	1.4 J	1.9 J	1.3 J	2.5 J	2.5 J
Copper	17.9	8.6	6.7	9.4	4.8 J	14.3	11.3
Cyanide	0.68						
Iron	45,400	21,700	18,100	22,100	13,000	24,400	25,100
Lead	17.4	11.7	11.4	12.4	11.4	18.5	9.8
Magnesium	1,220	584 J	310 J	343 J	320 J	759 J	287 J
Manganese	1,150	42.3 *	46.3	65.5	30.5	51.1	90.6
Mercury	0.18	0.25 J	0.88 J			4.1 J	
Nickel	18.2	2.6 J	0.87 J	2.1 J	1.1 J	2.6 J	2.3 J
Potassium	1,050	1,030 J	395 J	678 J	283 J	709 J	448 J
Selenium	2.6					0.86 J	
Silver	2.2	0.69 J*	0.59 J	0.67 J		1.8 J	0.94 J
Sodium	123			189 J			
Thallium	5.5						
Vanadium	72.7	31.6	22.2	28.3	15.7	33.1	30.1
Zinc	70.4	20.5	20	22.2	13.8	38.8	23.1

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**		Manhole S083	Manhole "A" (S082)		Manhole 471 (S081)	
Station ID	**Background**	IS53SB08	IS53SB09	IS53SB10	IS53SB11	IS53SB12	IS53SB13
Sample ID	**95% UCL for**	IS53SB081314	IS53SB090507	IS53SB100405	IS53SB110406	IS53SB120304	IS53SB130304
Sample Date	**Subsurface Soil**	05/08/01	05/07/01	05/07/01	05/07/01	05/08/01	05/08/01
Constituent Name							
Volatile Organic Compounds (µg/kg)							
Cumene		NA	NA	NA	NA	NA	
Tetrachloroethene		NA	NA	NA	NA	NA	9.9 J
Trichloroethene		NA	NA	NA	NA	NA	
Semi-volatile Organic Compounds (µg/kg)							
3- and 4-Methylphenol		NA	NA	NA	NA	NA	
Benzo(a)anthracene		NA	NA	NA	NA	NA	
Benzo(a)pyrene		NA	NA	NA	NA	NA	
Benzo(b)fluoranthene		NA	NA	NA	NA	NA	
Benzo(g,h,i)perylene		NA	NA	NA	NA	NA	
Benzo(k)fluoranthene		NA	NA	NA	NA	NA	
Butylbenzylphthalate		NA	NA	NA	NA	NA	52 J
Chrysene		NA	NA	NA	NA	NA	
Di-n-butylphthalate		NA	NA	NA	NA	NA	95 J
Diethylphthalate		NA	NA	NA	NA	NA	300 J
Fluoranthene		NA	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene		NA	NA	NA	NA	NA	
Pyrene		NA	NA	NA	NA	NA	
bis(2-Ethylhexyl)phthalate	120	NA	NA	NA	NA	NA	99 J
Explosives (µg/kg)							
4-Nitrotoluene		NA	NA	NA	NA	NA	
Nitrocellulose		NA	NA	NA	NA	NA	
Total Inorganics (mg/kg)							
Aluminum	20,400	14,100 J	8,970 J	13,000 J	15,000 J	6,080	3,820
Antimony	1.8	0.8 J		0.93 J	1.6 J		
Arsenic	9.8	8.4	7.9	13.5	11.4	2.2	3.3
Barium	68	55.4	29.8 J	49.2	38.6 J	20.8 J	32.7 J
Beryllium	0.96	0.72 B*	0.36 B*	0.44 B*	0.52 B*	0.31 J	0.19 J
Cadmium	0.14						
Calcium	479	83.4 J	297 J	1,060 J	73.3 J	83.6 J	246 J
Chromium	33.9	14.6	18.5	18.5	32.6	13.9	17.8
Cobalt	133	3.4 J	2.1 J	8 J	2.2 J	4.5 J	1.2 J
Copper	17.9	16.3	10.1	61.1	12	5.7	27.5
Cyanide	0.68						
Iron	45,400	29,000	30,400	17,400	49,500	13,500	13,200
Lead	17.4	16	13.1	443	12.9	7.8	22.5
Magnesium	1,220	694 J	410 J	683 J	544 J	221 J	69.8 J
Manganese	1,150	172	43.8	110	11.5	134	1.5 J
Mercury	0.18		0.17 J	32.4 J		1.1 J	362 J
Nickel	18.2	5.1 J	1.1 J	4 J		1.6 J	0.42 J
Potassium	1,050	1,010 J	645 J	542 J	836 J	245 J	116 J
Selenium	2.6		1.8				
Silver	2.2	1.1 J	1.3 J	0.98 J	2 J	0.84 J	0.89 J
Sodium	123	75.2 J					
Thallium	5.5				1.3 J		
Vanadium	72.7	31.6	33.1	30.4	51.9	22.2	27.4
Zinc	70.4	31.1	32.1	72	26	11.8 J	19.4 J

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**	Manhole "B"			"Dry Well"	Manhole 466 (S087)
Station ID	**Background**	IS53SB14	IS53SB15	IS53SB16	IS53SB17	IS53SB18
Sample ID	**95% UCL for**	IS53SB140304	IS53SB150304	IS53SB160304	IS53SB170102	IS53SB180607
Sample Date	**Subsurface Soil**	05/08/01	05/08/01	05/08/01	05/07/01	05/08/01
Constituent Name						
Volatile Organic Compounds (µg/kg)						
Cumene						NA
Tetrachloroethene						NA
Trichloroethene						NA
Semi-volatile Organic Compounds (µg/kg)						
3- and 4-Methylphenol						NA
Benzo(a)anthracene						NA
Benzo(a)pyrene						NA
Benzo(b)fluoranthene						NA
Benzo(g,h,i)perylene						NA
Benzo(k)fluoranthene						NA
Butylbenzylphthalate					59 J	NA
Chrysene						NA
Di-n-butylphthalate		97 J	90 J	73 J	120 J	NA
Diethylphthalate					360 J	NA
Fluoranthene						NA
Indeno(1,2,3-cd)pyrene						NA
Pyrene						NA
bis(2-Ethylhexyl)phthalate	120			43 J	60 B*	NA
Explosives (µg/kg)						
4-Nitrotoluene					1,100	NA
Nitrocellulose						NA
Total Inorganics (mg/kg)						
Aluminum	20,400	6,270	9,070	6,270	15,300 J	7,240 J
Antimony	1.8	0.87 J			0.76 J	
Arsenic	9.8		1.5 J	1.6 J	5.4	5.3
Barium	68	14.9 J	19.7 J	28.2 J	56.5	28.9 J
Beryllium	0.96	0.15 J	0.19 J	0.29 J	0.45 B*	0.45 J
Cadmium	0.14					
Calcium	479	395 J	174 J	1,180	953 J	1,500
Chromium	33.9	8.6	11.1	10.6	19.3	13.2
Cobalt	133	0.49 J	0.81 J	2 J	3.7 J	2 J
Copper	17.9	2.8 J	4 J	7.1	15	11.1
Cyanide	0.68					
Iron	45,400	8,630	13,200	8,920	20,100	19,500
Lead	17.4	6.5	6.9	15.6	49.3	10.2
Magnesium	1,220	180 J	311 J	380 J	784 J	458 J
Manganese	1,150	3.4 J	8.4	28.8	75.2	59.7
Mercury	0.18			3.1 J	21.8 J	0.32 J
Nickel	18.2		0.51 J	2 J	4.5 J	0.94 J
Potassium	1,050	172 J	260 J	252 J	784 J	460 J
Selenium	2.6					
Silver	2.2		0.4 J	0.49 J	0.51 J	0.69 J
Sodium	123					142 J
Thallium	5.5					
Vanadium	72.7	13.7	23.4	16.2	33.7	25.5
Zinc	70.4	6 J	13.3 J	37.3 J	134	14.9

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**	Manhole 469 (S062)	Manhole "A" (S082)		Manhole 471 (S081)	
Station ID	**Background**	IS53SB19	IS53SB20	IS53SB21	IS53SB22	IS53SB23
Sample ID	**95% UCL for**	IS53SB191214	IS53SB200506	IS53SB210607	IS53SB220405	IS53SB230708
Sample Date	**Subsurface Soil**	05/07/01	05/07/01	05/07/01	05/07/01	05/08/01
Constituent Name						
Volatile Organic Compounds (µg/kg)						
Cumene		NA	NA	NA	NA	NA
Tetrachloroethene		NA	NA	NA	NA	NA
Trichloroethene		NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)						
3- and 4-Methylphenol		NA	NA	NA	NA	NA
Benzo(a)anthracene		NA	NA	NA	NA	NA
Benzo(a)pyrene		NA	NA	NA	NA	NA
Benzo(b)fluoranthene		NA	NA	NA	NA	NA
Benzo(g,h,i)perylene		NA	NA	NA	NA	NA
Benzo(k)fluoranthene		NA	NA	NA	NA	NA
Butylbenzylphthalate		NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA
Di-n-butylphthalate		NA	NA	NA	NA	NA
Diethylphthalate		NA	NA	NA	NA	NA
Fluoranthene		NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene		NA	NA	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	120	NA	NA	NA	NA	NA
Explosives (µg/kg)						
4-Nitrotoluene		NA	NA	NA	NA	NA
Nitrocellulose		NA	NA	NA	NA	NA
Total Inorganics (mg/kg)						
Aluminum	20,400	15,000 J	14,200 J	16,500 J	13,100 J	8,180
Antimony	1.8		0.87 J	0.77 J	1.6 J	1.3 J
Arsenic	9.8	7.4	7.5	7.4	10.8	1.2 J
Barium	68	57.7	48.7 *	35.4 J	35.6 J	23.7 J
Beryllium	0.96	0.75 B*	0.38 B*	0.41 B*	0.46 B*	0.25 J
Cadmium	0.14					
Calcium	479	212 J	1,010 J*	371 J	50 J	342 J
Chromium	33.9	15.6	21.5	22	23.2	18.9
Cobalt	133	2.7 J	2.4 J*	2.4 J	2.3 J	1.3 J
Copper	17.9	14.2	8.5 *	9.3	11.9	6.6
Cyanide	0.68					
Iron	45,400	24,500	30,300	26,200	35,800	26,600
Lead	17.4	13.2	52.7 *	8.8	11.4	8.4
Magnesium	1,220	699 J	511 J	619 J	512 J	315 J
Manganese	1,150	58.3	102 *	13.2	21.8	10.7
Mercury	0.18	0.23 J		0.83 J		6.1 J
Nickel	18.2	5.7 J	2.1 J*	1.7 J	1.9 J	
Potassium	1,050	1,200 J	481 J	574 J	861 J	359 J
Selenium	2.6		2.3			
Silver	2.2	1 J	1.3 J	1 J	1.6 J	1.6 J
Sodium	123	73 J				
Thallium	5.5		2.1 J		1.1 J	2.3 J
Vanadium	72.7	35	42.8	43.5	41.2	27.8
Zinc	70.4	34.8	109.0 *	29.7	25.3	17.7 J

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**		Manhole 474	Manhole 473	Manhole 471 (S081)	Manhole "A" (S082)	Manhole S083
Station ID	**Background**	IS53SB24	IS53SD01	IS53SD02	IS53SD04	IS53SD05	IS53SD06
Sample ID	**95% UCL for**	IS53SB240910	IS53SD01	IS53SD02	IS53SD04	IS53SD05	IS53SD06
Sample Date	**Subsurface Soil**	05/08/01	05/03/01	05/03/01	05/03/01	05/03/01	05/03/01
Constituent Name							
Volatile Organic Compounds (µg/kg)							
Cumene		NA					
Tetrachloroethene		NA				5 J	
Trichloroethene		NA					
Semi-volatile Organic Compounds (µg/kg)							
3- and 4-Methylphenol		NA			88 J		
Benzo(a)anthracene		NA			69 J		
Benzo(a)pyrene		NA					
Benzo(b)fluoranthene		NA			69 J		
Benzo(g,h,i)perylene		NA					
Benzo(k)fluoranthene		NA					
Butylbenzylphthalate		NA					76 J
Chrysene		NA					
Di-n-butylphthalate		NA	67 J				
Diethylphthalate		NA			480 J	47 J	120 J
Fluoranthene		NA			81 J		
Indeno(1,2,3-cd)pyrene		NA					
Pyrene		NA			74 J		
bis(2-Ethylhexyl)phthalate	120	NA		79 J	75 J		150 J
Explosives (µg/kg)							
4-Nitrotoluene		NA					
Nitrocellulose		NA			5,000		
Total Inorganics (mg/kg)							
Aluminum	20,400	2,600	1,780 J	712 J	4,620 J	3,780 J	5,730 J
Antimony	1.8					1.6 J	5 J
Arsenic	9.8		16.9 L	1.5 L	4.3 L	7.7 L	8 L
Barium	68	17.7 J	54 J	205 J	130 J	45.5 J	94.5 J
Beryllium	0.96	0.09 J	0.19 J	0.06 J	0.16 J	0.21 J	0.33 J
Cadmium	0.14		3.9	0.27 J	0.34 J		4.5
Calcium	479	58.5 J	21,300 J	13,000 J	4,030 J	2,020 J	6,560 J
Chromium	33.9	1.6 J	12 L	6.7 L	26 L	109 L	49.5 L
Cobalt	133		12.6	2.3 J	4.3 J	13.3	9.4 J
Copper	17.9	2.3 J	34.4	8.6	69.3	361	366
Cyanide	0.68						
Iron	45,400	969	24,300	5,840	9,950	99,000	30,900
Lead	17.4	5.6	61.9 J	28.7 J	1,510 J	125 J	296 J
Magnesium	1,220	132 J	12,800	9,250	605 J	1,530	1,150 J
Manganese	1,150	0.56 J	2,430 L	43.6 L	62.4 L	1,320 L	556 L
Mercury	0.18	0.16 J	1.24	0.34	1,290	547	96
Nickel	18.2		18.2	21.8	5.2 J	70.8	20.8
Potassium	1,050	79.3 J	180 J	45.7 J	783 J	237 J	345 J
Selenium	2.6		0.54 R*	0.47 R*	0.87 R*	0.57 R*	1.8 L
Silver	2.2		0.34 L		63.6 L	22.2 L	40.7 L
Sodium	123	104 J	434 J	84.1 J	460 J		565 J
Thallium	5.5		0.71 J				2.9 J
Vanadium	72.7		10.6 J	4.2 J	11.5 J	22.2	22.2
Zinc	70.4	3.4 J	1,480	175	159	400	1,680

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-3
Lab Area Subsurface Soil and Sewer Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Manhole Associated With Sample	**Base-Wide**	Manhole "B"	Manhole 466 (S087)	Manhole "C"
Station ID	**Background**	IS53SD07	IS53SD09	IS53SD10
Sample ID	**95% UCL for**	IS53SD07	IS53SD09	IS53SD10
Sample Date	**Subsurface Soil**	05/03/01	05/03/01	05/03/01
Constituent Name				
Volatile Organic Compounds (µg/kg)				
Cumene				
Tetrachloroethene			43	
Trichloroethene				
Semi-volatile Organic Compounds (µg/kg)				
3- and 4-Methylphenol				
Benzo(a)anthracene			460 J	510 *
Benzo(a)pyrene			420 J	470 *
Benzo(b)fluoranthene			680 J	580 *
Benzo(g,h,i)perylene			190 J	170 J*
Benzo(k)fluoranthene			310 J	310 J*
Butylbenzylphthalate			150 J	47 J
Chrysene			470 J	550 *
Di-n-butylphthalate		73 J	350 J	160 J
Diethylphthalate		47 J	1,100 J	3,500
Fluoranthene			250 J	280 J*
Indeno(1,2,3-cd)pyrene			220 J	190 J*
Pyrene			240 J	290 J*
bis(2-Ethylhexyl)phthalate	120	250 J	340 J	170 J
Explosives (µg/kg)				
4-Nitrotoluene				
Nitrocellulose			10,000	
Total Inorganics (mg/kg)				
Aluminum	20,400	3,920 J	3,020 J	3,330 J*
Antimony	1.8	5.8 J		1.6 J
Arsenic	9.8	12.7 L	3 L	4.3 L
Barium	68	39.3 J	222 J	18.5 J*
Beryllium	0.96	0.27 J	0.33 J	0.17 J*
Cadmium	0.14	0.6 J	2 J	0.49 J*
Calcium	479	1,700 J	35,600 J	127,000 J
Chromium	33.9	39.8 L	16.7 L	21.4 L
Cobalt	133	5.8 J	3.7 J	2.4 J*
Copper	17.9	130	277	66 *
Cyanide	0.68			12.3 *
Iron	45,400	13,000	15,000	25,000
Lead	17.4	290 J	228 J	92 J*
Magnesium	1,220	966 J	2,690 J	87,400
Manganese	1,150	635 L	402 L	225 L
Mercury	0.18	120	69	0.69
Nickel	18.2	15.7	23.4 J	8.9 J
Potassium	1,050	255 J	1,270 J	427 J*
Selenium	2.6	0.6 R*	1.6 R*	0.55 R*
Silver	2.2	6.2 L	17.2 L	
Sodium	123	148 J	670 J	198 J*
Thallium	5.5		1.9 J	
Vanadium	72.7	45	4.2 J	14.1 *
Zinc	70.4	581	1,310	530 *

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.

2. Blank cells indicate constiutent was not detected.

3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

4. Background data for clay-like subsurface soils from TetraTech NUS Background Study dated February 2002.

*Higher value from original sample or duplicate sample is presented, where applicable.

B = Analyte also detected in associated blank

D = Diluted L = Biased Low

J = Estimated R = Rejected by Data Validator

K = Biased High NA - Not analyzed

Table 3-4
Lab Area Wetland Surface Water Sample
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SW01
Sample ID	IS53SW01
Sample Date	05/03/01
Constituent Name	
Total Inorganics (µg/l)	
Aluminum	514 J
Arsenic	47
Barium	10.1 J
Beryllium	0.11 J*
Cadmium	0.82 J
Calcium	2,680 J
Cobalt	3.1 J
Copper	3.4 J*
Cyanide	10
Iron	2,760
Lead	5.2
Magnesium	846 J
Manganese	1,300
Mercury	1 L*
Potassium	2,590 J
Selenium	4.9 J
Sodium	95,100 J
Zinc	28.2
Wet Chemistry (mg/l)	
Hardness	11 *

Notes, Abbreviations, and Qualifiers

1. No VOCs, SVOCs, or explosives were detected.
2. No freshwater background data available.

*Higher value from original sample or duplicate sample is presented, where applicable.
mg/l = milligrams per liter
µg/l = micrograms per liter
J = Reported value is estimated
L = Reported value may be biased low

Table 3-5
Lab Area Wetland Sediment Samples
Detected Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID **Sample ID** **Sample Date**	**Base-Wide Background 95% UCL**	IS53SD14 IS53SD14 05/02/01	IS53SD15 IS53SD15 05/02/01
Constituent Name			
Semi-volatile Organic Compounds (µg/kg)			
Di-n-butylphthalate		140 J	NA
Total Inorganics (mg/kg)			
Aluminum	13,234	9,660 J*	4,730
Arsenic	10.6	20.2 *	3.9
Barium	145	138	53 J
Beryllium	1	0.71 J	0.36 J
Cadmium	0.57	1.1 J	0.25 J
Calcium	10,100	2,280 J	1,770
Chromium	22.9	16.4	10.1
Cobalt	17.6	28.0 *	10.9 J
Copper	28.3	28.2	12
Iron	42,900	17,000	9,090
Lead	79.3	82.8	32.3
Magnesium	3,030	1,150 J	810 J
Manganese	444	1,070	488
Mercury	0.196	24.5	18.6
Nickel	25.2	17.8 J	6.3 J
Potassium	1,328	425 J	294 J
Silver	0.92	2.2 J	0.44 J
Sodium	144	303 J	
Vanadium	46.3	65.9	24.4
Zinc	158	189	83
Wet Chemistry (mg/kg)			
Total organic carbon (TOC)	43,500	97,000 *	53,000
pH	No value	7	7.1

Notes, Abbreviations, and Qualifiers

1. Shaded cells indicate constituent concentration exceeded representative background value.
2. Blank cells indicate constiutent was not detected.
3. Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.
4. Background data for freshwater sediment from Brown & Root Background Study dated December 1997.
5. Dry sediment samples IS53SD16 - IS53SD19 are included with the Lab Area Surface Soil Detects in Table 3-1

*Higher value from original sample or duplicate sample is presented, where applicable.

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

J = Reported value is estimated

NA = Not analyzed

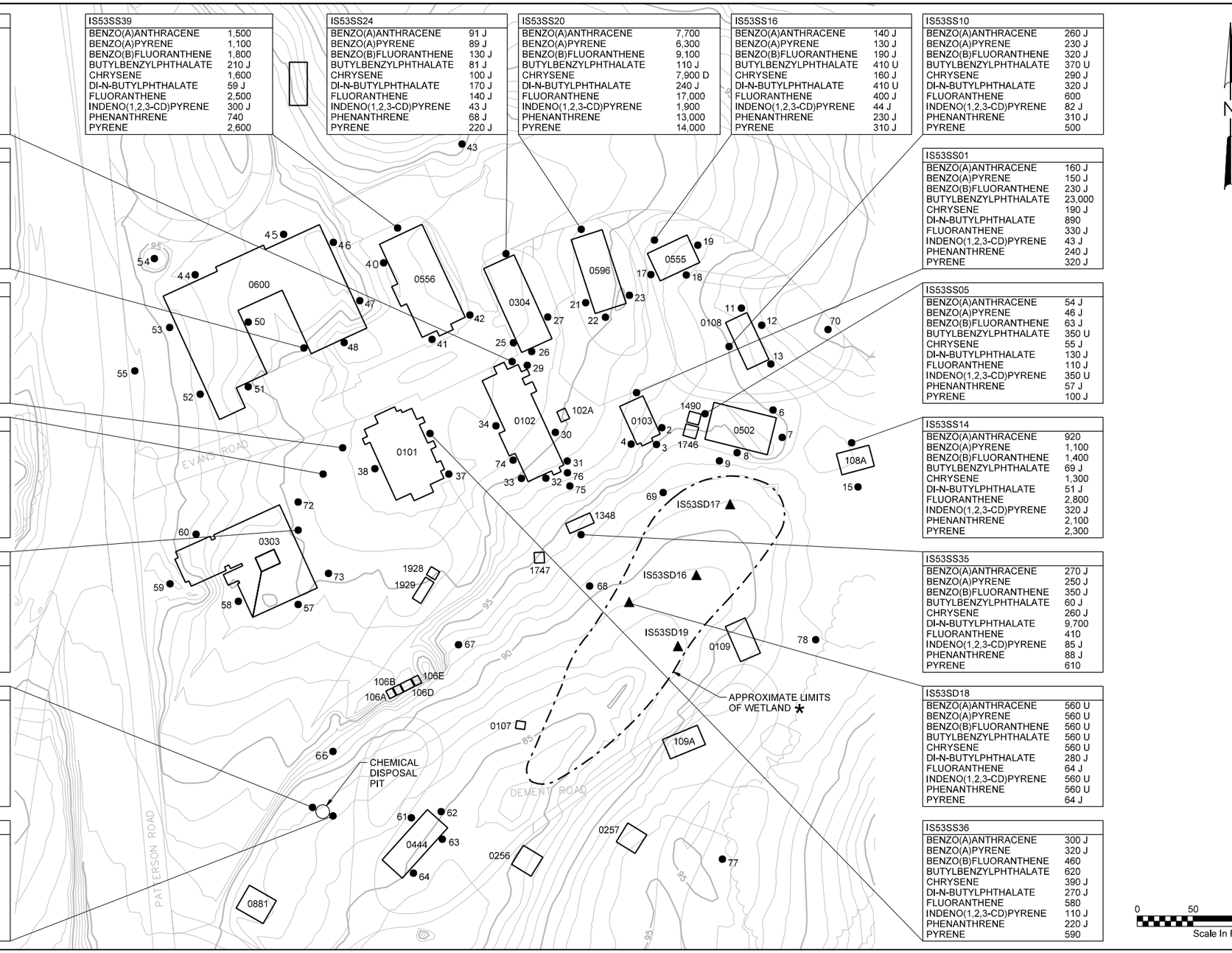
Table 3-6
Possible Sources of Anthropogenic Mercury Emissions
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Area Sources	Point Sources		
	Combustion	Manufacturing	Miscellaneous
Electric Lamp breakage	Utility boilers	Chlor-alkali production	Oil shale retorting
Paint use	Commercial/Industrial boilers	Lime manufacturing	Mercury catalysts
Laboratory use	residential boilers	Primary mercury production[a]	Geothermal power plants
Dental preparations	Municipal waste combustors	Mercury Compounds production	Municipal waste landfills
Mobile Sources[a]	Medical waste incincerators	Batter production	Explosives manufacturing
Agricultural burning[a]	sewage sludge incincerators	Electrical apparatus manufacturing	
Landfills	Hazardous waste combustors	Carbon black production	
Sludge application[a]	Wood-fired boilers	Byproduct coke production	
	Residential woodstoves[a]	Primary copper smelting	
	Crematories	Cement manufacturing	
		Primary lead smelting	
		Petroeum refining[a]	
		Intrument manufacturing	
		Secondary mercury production	
		Zinc mining[a]	
		Fluorescent lamp recycling	
		Pulp and paper mills	

Notes

Adapted from USEPA's *Mercury Study Report to Congress* . EPA-452/R-97-004. December 1997.

[a] Potential anthropogenic sources of mercury for which emissions were not estimated



IS53SS28	
BENZO(A)ANTHRACENE	170 J
BENZO(A)PYRENE	160 J
BENZO(B)FLUORANTHENE	180 J
BUTYLBENZYLPHTHALATE	190 J
CHRYSENE	200 J
DI-N-BUTYLPHTHALATE	250 J
FLUORANTHENE	270 J
INDENO(1,2,3-CD)PYRENE	66 J
PHENANTHRENE	150 J
PYRENE	360 J

IS53SS39	
BENZO(A)ANTHRACENE	1,500
BENZO(A)PYRENE	1,100
BENZO(B)FLUORANTHENE	1,800
BUTYLBENZYLPHTHALATE	210 J
CHRYSENE	1,600
DI-N-BUTYLPHTHALATE	59 J
FLUORANTHENE	2,500
INDENO(1,2,3-CD)PYRENE	300 J
PHENANTHRENE	740
PYRENE	2,600

IS53SS24	
BENZO(A)ANTHRACENE	91 J
BENZO(A)PYRENE	89 J
BENZO(B)FLUORANTHENE	130 J
BUTYLBENZYLPHTHALATE	81 J
CHRYSENE	100 J
DI-N-BUTYLPHTHALATE	170 J
FLUORANTHENE	140 J
INDENO(1,2,3-CD)PYRENE	43 J
PHENANTHRENE	68 J
PYRENE	220 J

IS53SS20	
BENZO(A)ANTHRACENE	7,700
BENZO(A)PYRENE	6,300
BENZO(B)FLUORANTHENE	9,100
BUTYLBENZYLPHTHALATE	110 J
CHRYSENE	7,900 D
DI-N-BUTYLPHTHALATE	240 J
FLUORANTHENE	17,000
INDENO(1,2,3-CD)PYRENE	1,900
PHENANTHRENE	13,000
PYRENE	14,000

IS53SS16	
BENZO(A)ANTHRACENE	140 J
BENZO(A)PYRENE	130 J
BENZO(B)FLUORANTHENE	190 J
BUTYLBENZYLPHTHALATE	410 U
CHRYSENE	160 J
DI-N-BUTYLPHTHALATE	410 U
FLUORANTHENE	400 J
INDENO(1,2,3-CD)PYRENE	44 J
PHENANTHRENE	230 J
PYRENE	310 J

IS53SS10	
BENZO(A)ANTHRACENE	260 J
BENZO(A)PYRENE	230 J
BENZO(B)FLUORANTHENE	320 J
BUTYLBENZYLPHTHALATE	370 U
CHRYSENE	290 J
DI-N-BUTYLPHTHALATE	320 J
FLUORANTHENE	600
INDENO(1,2,3-CD)PYRENE	82 J
PHENANTHRENE	310 J
PYRENE	500

IS53SS49	
BENZO(A)ANTHRACENE	170 J
BENZO(A)PYRENE	150 J
BENZO(B)FLUORANTHENE	220 J
BUTYLBENZYLPHTHALATE	42 J
CHRYSENE	170 J
DI-N-BUTYLPHTHALATE	88 J
FLUORANTHENE	280 J
INDENO(1,2,3-CD)PYRENE	57 J
PHENANTHRENE	110 J
PYRENE	280 J

IS53SS01	
BENZO(A)ANTHRACENE	160 J
BENZO(A)PYRENE	150 J
BENZO(B)FLUORANTHENE	230 J
BUTYLBENZYLPHTHALATE	23,000
CHRYSENE	190 J
DI-N-BUTYLPHTHALATE	890
FLUORANTHENE	330 J
INDENO(1,2,3-CD)PYRENE	43 J
PHENANTHRENE	240 J
PYRENE	320 J

IS53SS71	
BENZO(A)ANTHRACENE	360 J
BENZO(A)PYRENE	280 J
BENZO(B)FLUORANTHENE	400 J
BUTYLBENZYLPHTHALATE	900
CHRYSENE	350 J
DI-N-BUTYLPHTHALATE	95 J
FLUORANTHENE	740
INDENO(1,2,3-CD)PYRENE	150 J
PHENANTHRENE	550
PYRENE	670

IS53SS05	
BENZO(A)ANTHRACENE	54 J
BENZO(A)PYRENE	46 J
BENZO(B)FLUORANTHENE	63 J
BUTYLBENZYLPHTHALATE	350 U
CHRYSENE	55 J
DI-N-BUTYLPHTHALATE	130 J
FLUORANTHENE	110 J
INDENO(1,2,3-CD)PYRENE	350 U
PHENANTHRENE	57 J
PYRENE	100 J

IS53SS65	
BENZO(A)ANTHRACENE	73 J
BENZO(A)PYRENE	66 J
BENZO(B)FLUORANTHENE	94 J
BUTYLBENZYLPHTHALATE	380 U
CHRYSENE	84 J
DI-N-BUTYLPHTHALATE	380 U
FLUORANTHENE	160 J
INDENO(1,2,3-CD)PYRENE	41 J
PHENANTHRENE	94 J
PYRENE	140 J

IS53SS14	
BENZO(A)ANTHRACENE	920
BENZO(A)PYRENE	1,100
BENZO(B)FLUORANTHENE	1,400
BUTYLBENZYLPHTHALATE	69 J
CHRYSENE	1,300
DI-N-BUTYLPHTHALATE	51 J
FLUORANTHENE	2,800
INDENO(1,2,3-CD)PYRENE	320 J
PHENANTHRENE	2,100
PYRENE	2,300

IS53SS56	
BENZO(A)ANTHRACENE	350 U
BENZO(A)PYRENE	350 U
BENZO(B)FLUORANTHENE	350 U
BUTYLBENZYLPHTHALATE	350 U
CHRYSENE	350 U
DI-N-BUTYLPHTHALATE	100 J
FLUORANTHENE	350 U
INDENO(1,2,3-CD)PYRENE	350 U
PHENANTHRENE	350 U
PYRENE	350 U

IS53SS35	
BENZO(A)ANTHRACENE	270 J
BENZO(A)PYRENE	250 J
BENZO(B)FLUORANTHENE	350 J
BUTYLBENZYLPHTHALATE	60 J
CHRYSENE	260 J
DI-N-BUTYLPHTHALATE	9,700
FLUORANTHENE	410
INDENO(1,2,3-CD)PYRENE	85 J
PHENANTHRENE	88 J
PYRENE	610

IS49SS01	
BENZO(A)ANTHRACENE	63 J
BENZO(A)PYRENE	70 J
BENZO(B)FLUORANTHENE	95 J
BUTYLBENZYLPHTHALATE	360 U
CHRYSENE	76 J
DI-N-BUTYLPHTHALATE	45 J
FLUORANTHENE	120 J
INDENO(1,2,3-CD)PYRENE	43 J
PHENANTHRENE	59 J
PYRENE	110 J

IS53SD18	
BENZO(A)ANTHRACENE	560 U
BENZO(A)PYRENE	560 U
BENZO(B)FLUORANTHENE	560 U
BUTYLBENZYLPHTHALATE	560 U
CHRYSENE	560 U
DI-N-BUTYLPHTHALATE	280 J
FLUORANTHENE	64 J
INDENO(1,2,3-CD)PYRENE	560 U
PHENANTHRENE	560 U
PYRENE	64 J

IS49SS02	
BENZO(A)ANTHRACENE	110 J
BENZO(A)PYRENE	110 J
BENZO(B)FLUORANTHENE	150 J
BUTYLBENZYLPHTHALATE	340 U
CHRYSENE	130 J
DI-N-BUTYLPHTHALATE	52 J
FLUORANTHENE	230 J
INDENO(1,2,3-CD)PYRENE	58 J
PHENANTHRENE	140 J
PYRENE	220 J

IS53SS36	
BENZO(A)ANTHRACENE	300 J
BENZO(A)PYRENE	320 J
BENZO(B)FLUORANTHENE	460
BUTYLBENZYLPHTHALATE	620
CHRYSENE	390 J
DI-N-BUTYLPHTHALATE	270 J
FLUORANTHENE	580
INDENO(1,2,3-CD)PYRENE	110 J
PHENANTHRENE	220 J
PYRENE	590

LEGEND:

● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)

▲ DRY SEDIMENT SAMPLE LOCATION

* ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

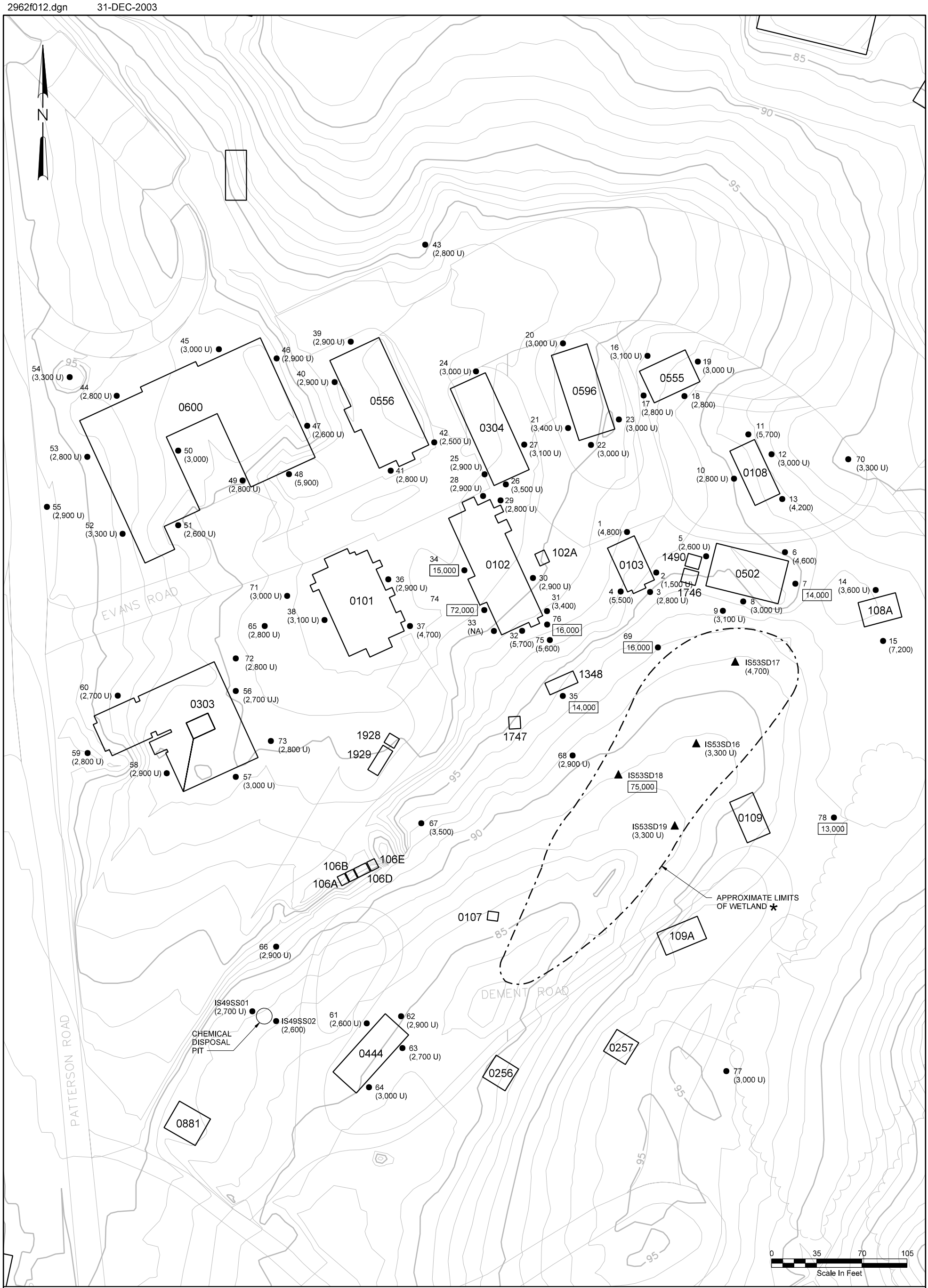
ALL CONCENTRATIONS IN UG/KG
D = DILUTED
J = ESTIMATED VALUE
U = NOT DETECTED ABOVE CORRESPONDING DETECTION LIMIT
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE
HIGHEST VALUE FROM ORIGINAL OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

BASE-WIDE BACKGROUND	95% UCL
BENZO(A)ANTHRACENE	480
BENZO(A)PYRENE	390
BENZO(B)FLUORANTHENE	420
BUTYLBENZYLPHTHALATE	NOT DETECTED
CHRYSENE	440
DI-N-BUTYLPHTHALATE	NOT DETECTED
FLUORANTHENE	1,100
INDENO(1,2,3-CD)PYRENE	100
PHENANTHRENE	1,100
PYRENE	880

Figure 3-1
SELECT SVOC CONCENTRATIONS IN
SURFACE SOIL AND DRY SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f012.dgn 31-DEC-2003



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SITE 53 CONGLOMERATE SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ DRY SEDIMENT SAMPLE LOCATION
- (2,600) NITROCELLULOSE CONCENTRATION IN UG/KG
- [16,000] SELECT HIGHER NITROCELLULOSE CONCENTRATION IN UG/KG (ABOVE 10,000 UG/KG)
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

U = NOT DETECTED ABOVE CORRESPONDING DETECTION LIMIT
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE
DUP = VALUE FROM DUPLICATE
NA = NOT ANALYZED

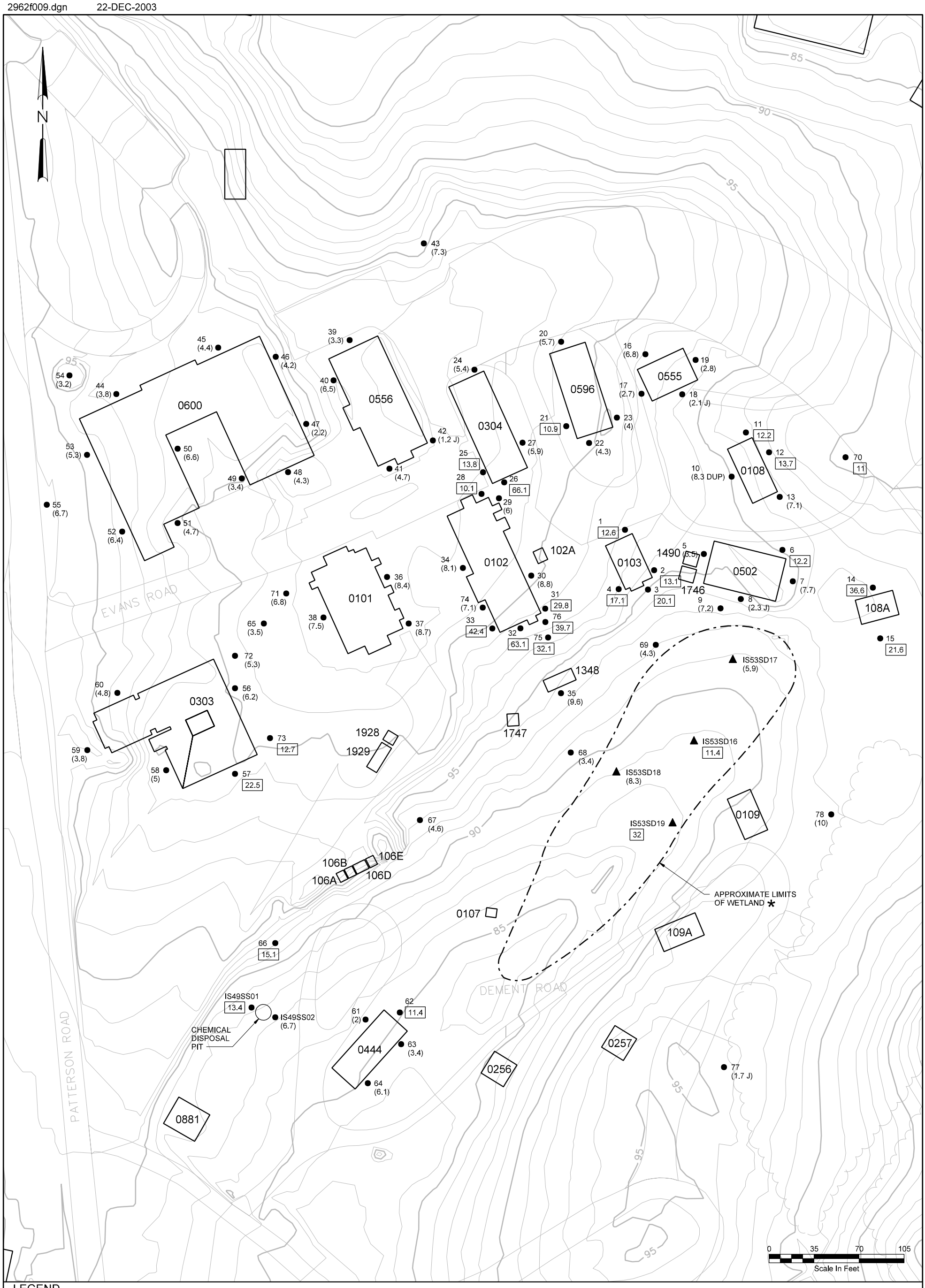
HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

NITROCELLULOSE WAS NOT DETECTED DURING BASE-WIDE BACKGROUND STUDY.

Figure 3-2
NITROCELLULOSE DETECTIONS IN LAB AREA SURFACE SOIL AND DRY SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f009.dgn 22-DEC-2003



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ DRY SEDIMENT SAMPLE LOCATION
- (3.8) ARSENIC CONCENTRATION IN MG/KG
- [20.8] SELECT HIGHER ARSENIC CONCENTRATIONS IN MG/KG (ABOVE 10 MG/KG)
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

J = ESTIMATED VALUE

HIGHEST VALUE FROM ORIGINAL OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

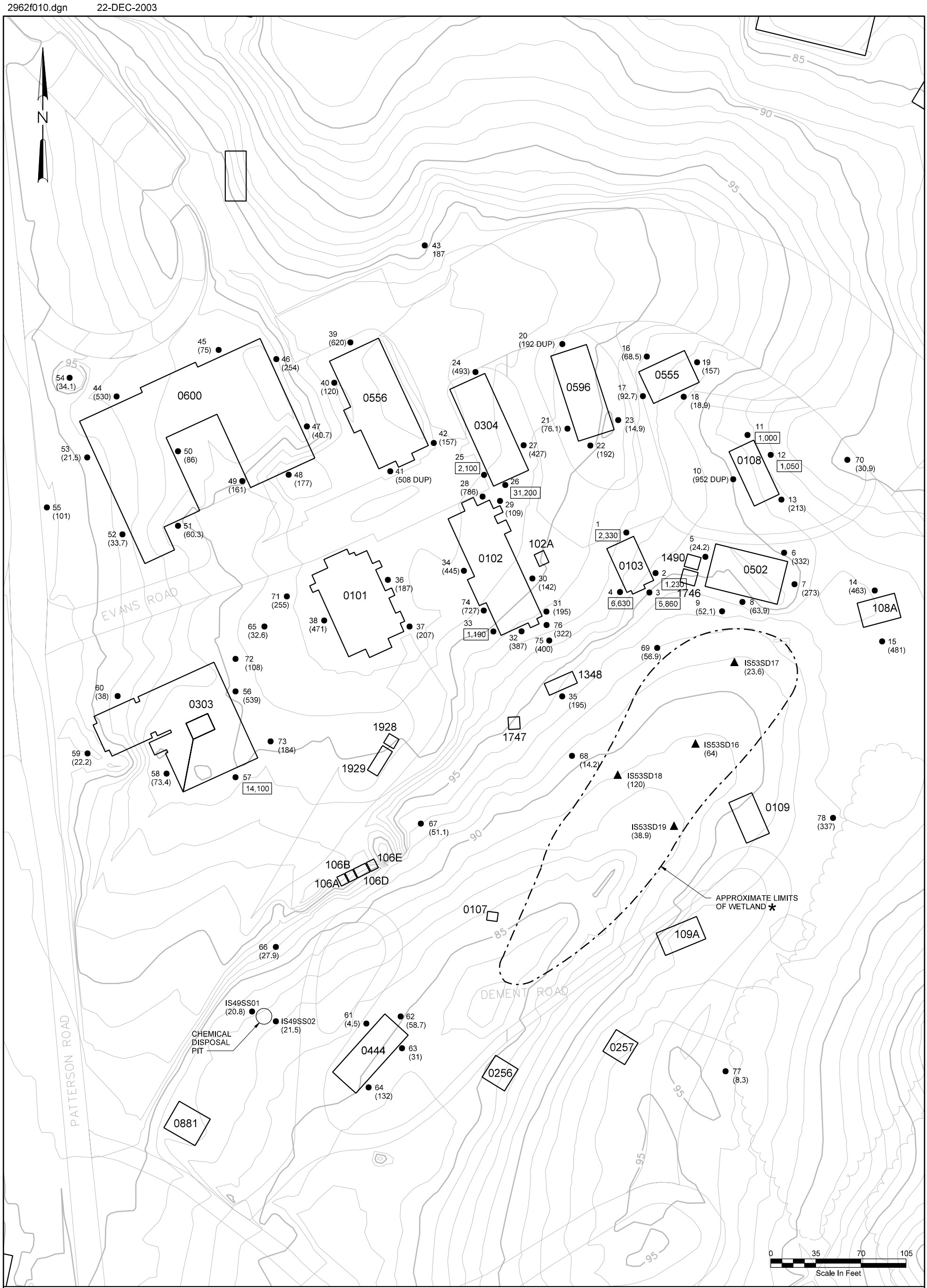
BASE-WIDE BACKGROUND 95% UCL = 5.2 MG/KG
BASE-WIDE BACKGROUND MEAN CONCENTRATION = 4 MG/KG

LAB AREA SURFACE SOIL MEAN CONCENTRATION = 10.95 MG/KG

Figure 3-3
ARSENIC DETECTIONS IN LAB AREA
SURFACE SOIL AND DRY SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f010.dgn 22-DEC-2003



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SITE 53 CONGLOMERATE SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ DRY SEDIMENT SAMPLE LOCATION
- (13.4) LEAD CONCENTRATION IN MG/KG
- [14,100] SELECT HIGHER LEAD CONCENTRATION IN MG/KG (ABOVE 1,000 MG/KG)
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

HIGHEST VALUE FROM ORIGINAL OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

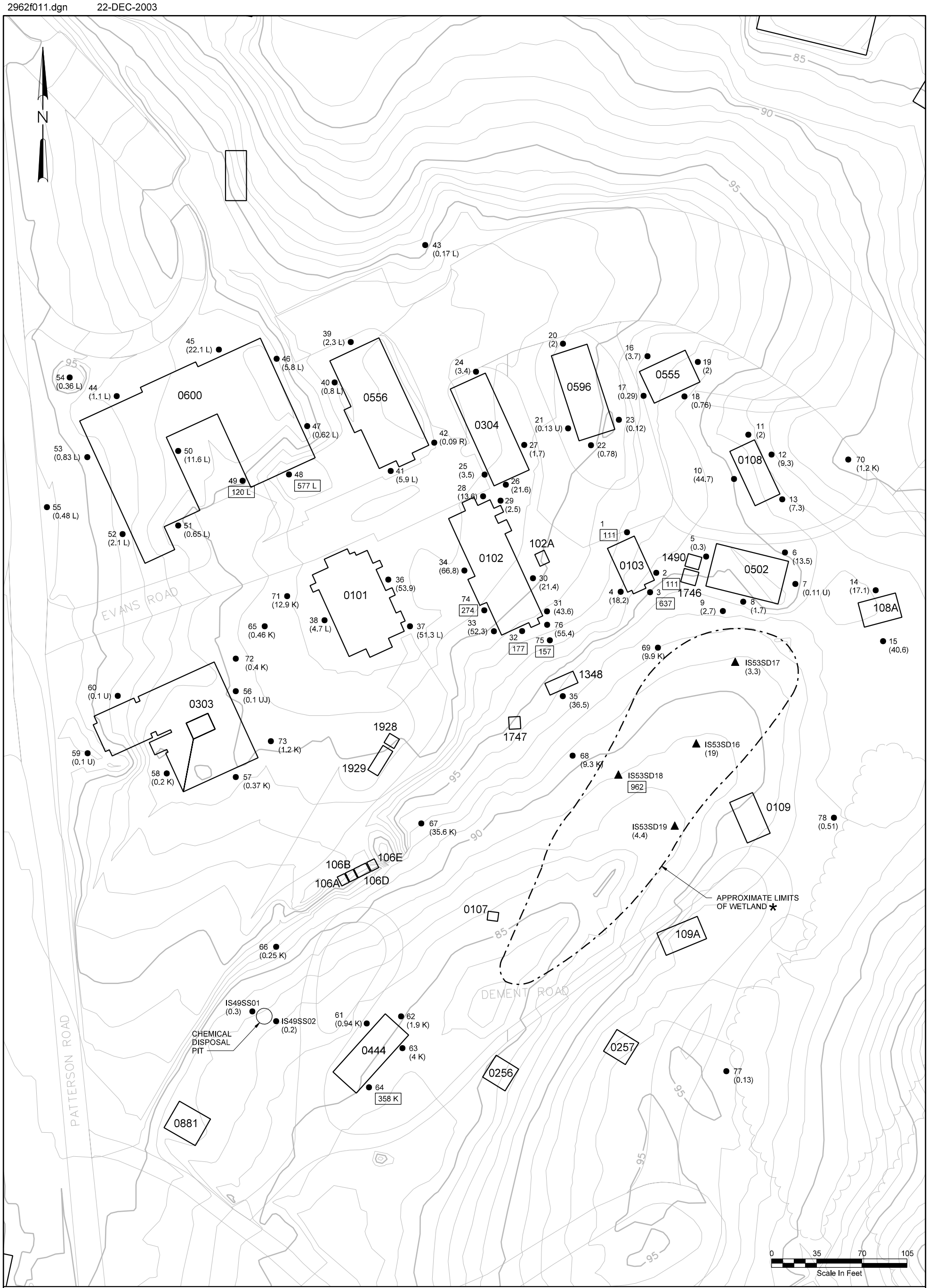
BASE-WIDE BACKGROUND 95% UCL = 21.7 MG/KG
BASE-WIDE BACKGROUND MEAN CONCENTRATION = 17.9 MG/KG

LAB AREA SURFACE SOIL MEAN CONCENTRATION = 987.36 MG/KG

Figure 3-4
LEAD DETECTIONS IN LAB AREA
SURFACE SOIL AND DRY SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f011.dgn 22-DEC-2003



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION (TRUNCATED SAMPLE ID SHOWN FOR SITE 53 CONGLOMERATE SURFACE SOIL SAMPLES. NOTE SAMPLE ID FORMAT WOULD BE IS53SS##0001)
- ▲ DRY SEDIMENT SAMPLE LOCATION
- (0.2) MERCURY CONCENTRATION IN MG/KG
- 177 SELECT HIGHER MERCURY CONCENTRATIONS IN MG/KG (ABOVE 100 MG/KG)
- * ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

L = VALUE MAY BE BIASED LOW
U = NOT DETECTED ABOVE CORRESPONDING DETECTION LIMIT
R = UNRELIABLE RESULT
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE
K = VALUE MAY BE BAISED HIGH

HIGHEST VALUE FROM ORIGINAL OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

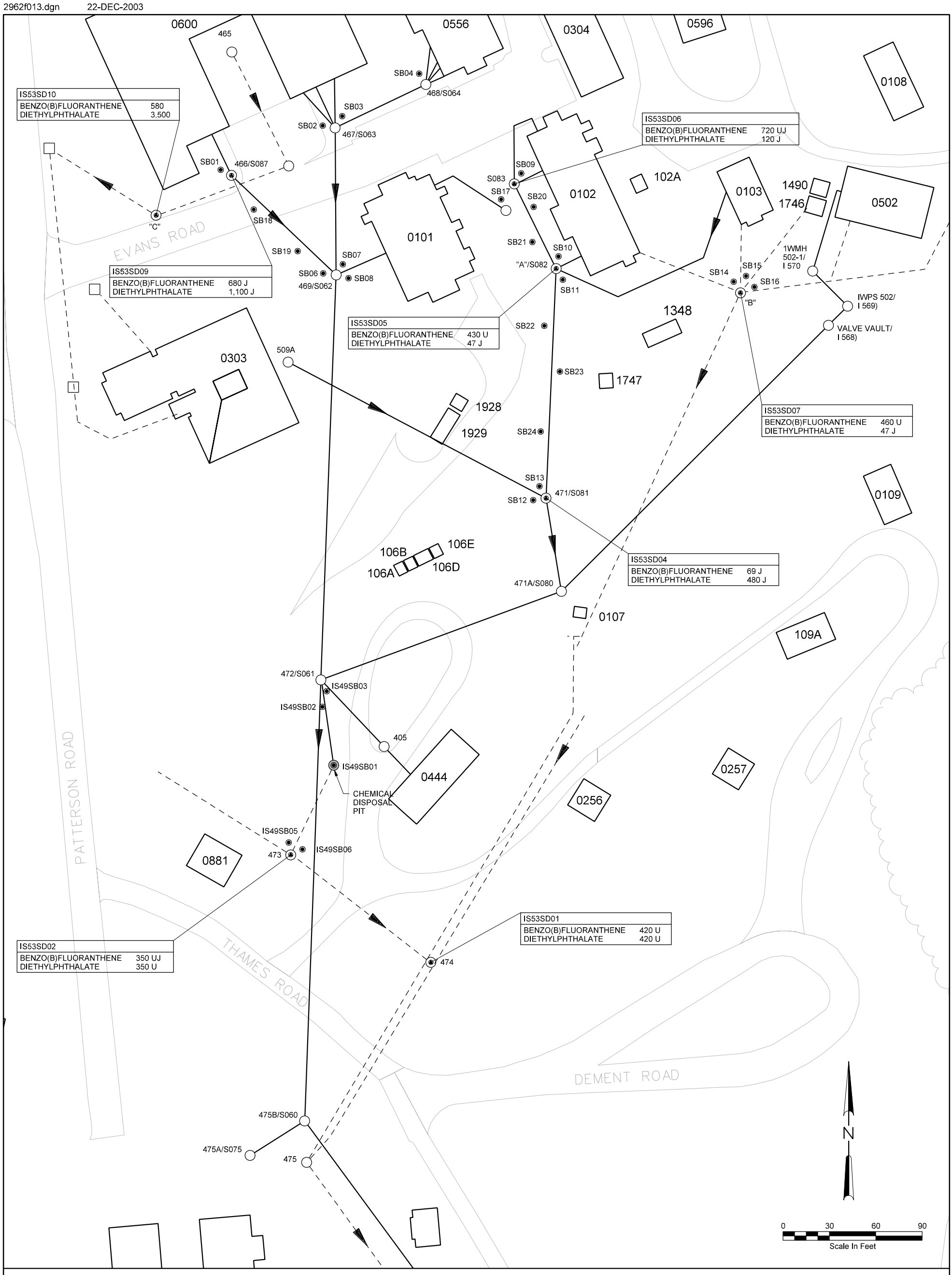
BASE-WIDE BACKGROUND 95% UCL = 0.06 MG/KG
BASE-WIDE BACKGROUND MEAN CONCENTRATION = 0.05 MG/KG

LAB AREA SURFACE SOIL MEAN CONCENTRATION = 52.4 MG/KG

Figure 3-5
MERCURY DETECTIONS IN LAB AREA
SURFACE SOIL AND DRY SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f013.dgn 22-DEC-2003



LEGEND:

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER

NOTES:

1. SUBSURFACE SOIL SAMPLE ID FORMAT WOULD BE IS53SB##BDED. BD IS THE BEGINNING DEPTH AND ED IS THE ENDING DEPTH OF THE SUBSURFACE SOIL SAMPLE.
2. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
3. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
4. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
5. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

U = NOT DETECTED ABOVE CORRESPONDING DETECTION LIMIT
J = ESTIMATED VALUE
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE

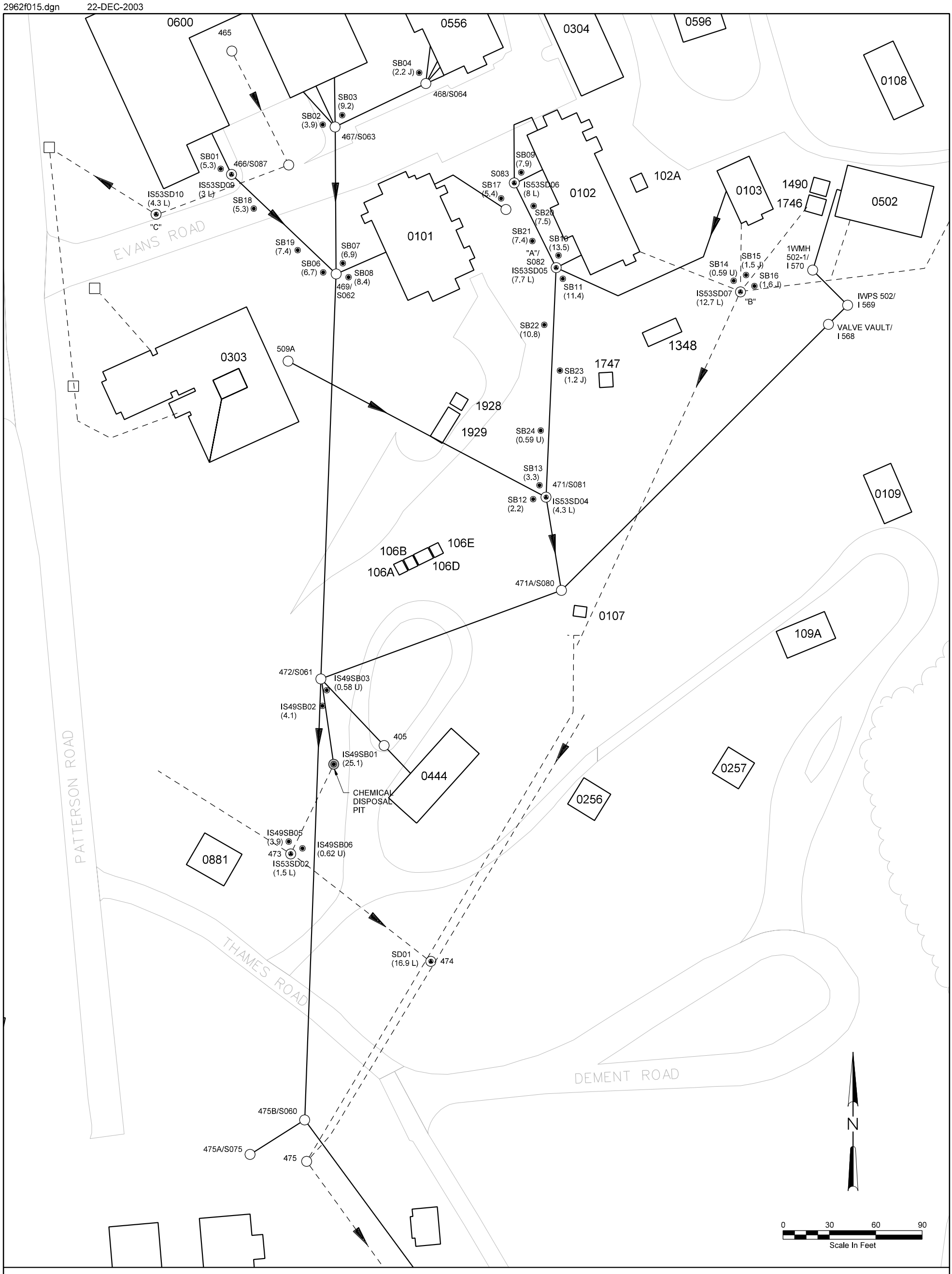
ALL CONCENTRATIONS IN UG/KG.

NO BASE-WIDE BACKGROUND DATA AVAILABLE.

FIGURE 3-6
SELECT SVOC CONCENTRATIONS
IN SEWER SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f015.dgn 22-DEC-2003



LEGEND:

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER
- (8.4) ARSENIC CONCENTRATION IN MG/KG

NOTES:

1. SUBSURFACE SOIL SAMPLE ID FORMAT WOULD BE IS53SB##BDED. BD IS THE BEGINNING DEPTH AND ED IS THE ENDING DEPTH OF THE SUBSURFACE SOIL SAMPLE.
2. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
3. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
4. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
5. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

U = NOT DETECTED
J = ESTIMATED VALUE
L = REPORTED VALVE MAY BE BIASED LOW

ALL CONCENTRATIONS IN MG/KG

HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

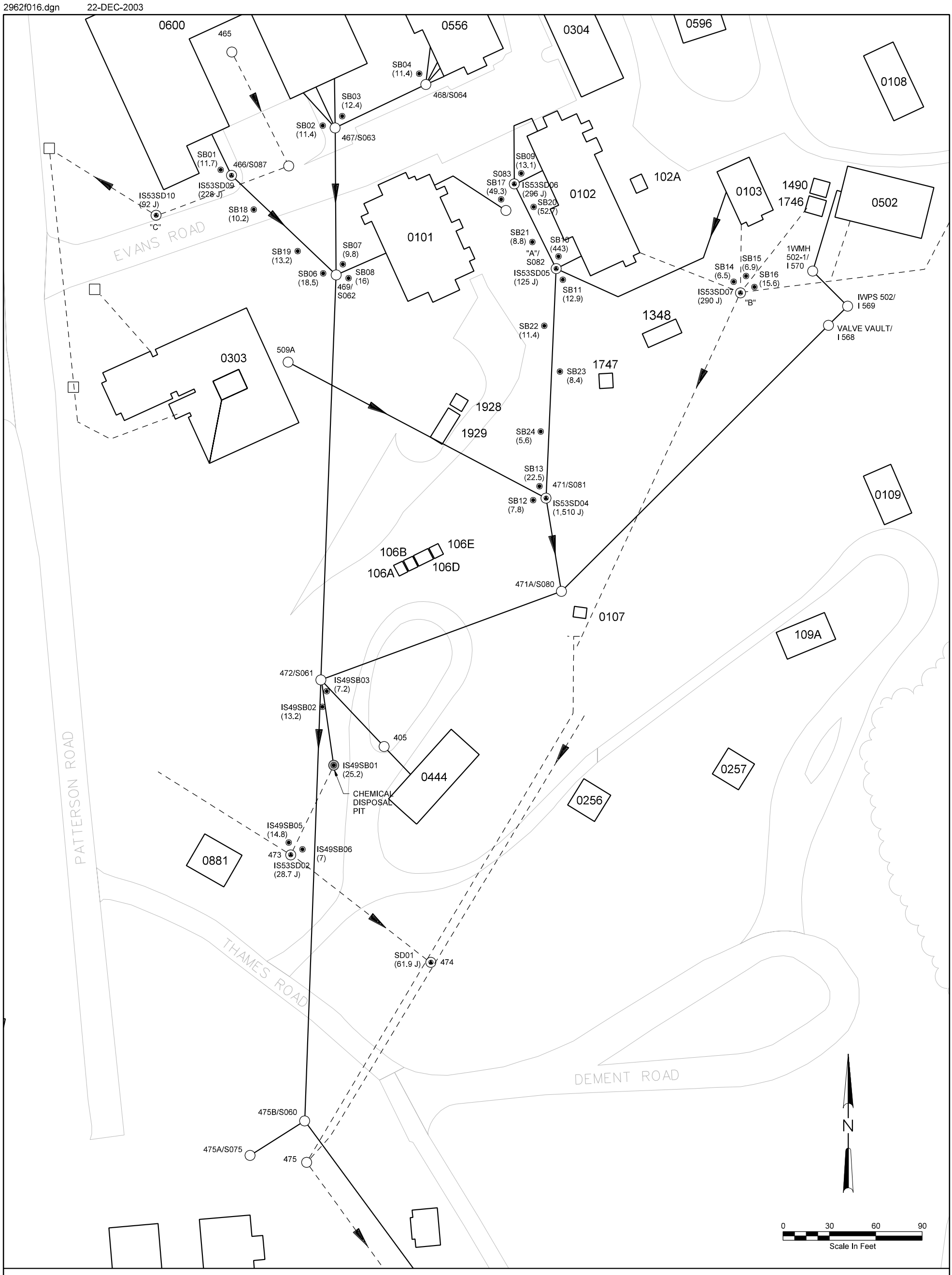
SUBSURFACE SOIL BASE-WIDE BACKGROUND 95% UCL = 9.8 MG/KG
SUBSURFACE SOIL BASE-WIDE BACKGROUND MEAN CONCENTRATION = 7.6 MG/KG

LAB AREA SUBSURFACE SOIL MEAN CONCENTRATION = 5.83 MG/KG
LAB AREA SEWER SEDIMENT MEAN CONCENTRATION = 7.3 MG/KG

FIGURE 3-7
ARSENIC CONCENTRATIONS IN SUBSURFACE SOIL AND SEWER SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f016.dgn 22-DEC-2003



LEGEND:

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER
- (14.8) MERCURY CONCENTRATION IN MG/KG

NOTES:

1. SUBSURFACE SOIL SAMPLE ID FORMAT WOULD BE IS53SB##BDED. BD IS THE BEGINNING DEPTH AND ED IS THE ENDING DEPTH OF THE SUBSURFACE SOIL SAMPLE.
2. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
3. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
4. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
5. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

J = ESTIMATED VALUE

ALL CONCENTRATIONS IN MG/KG

HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

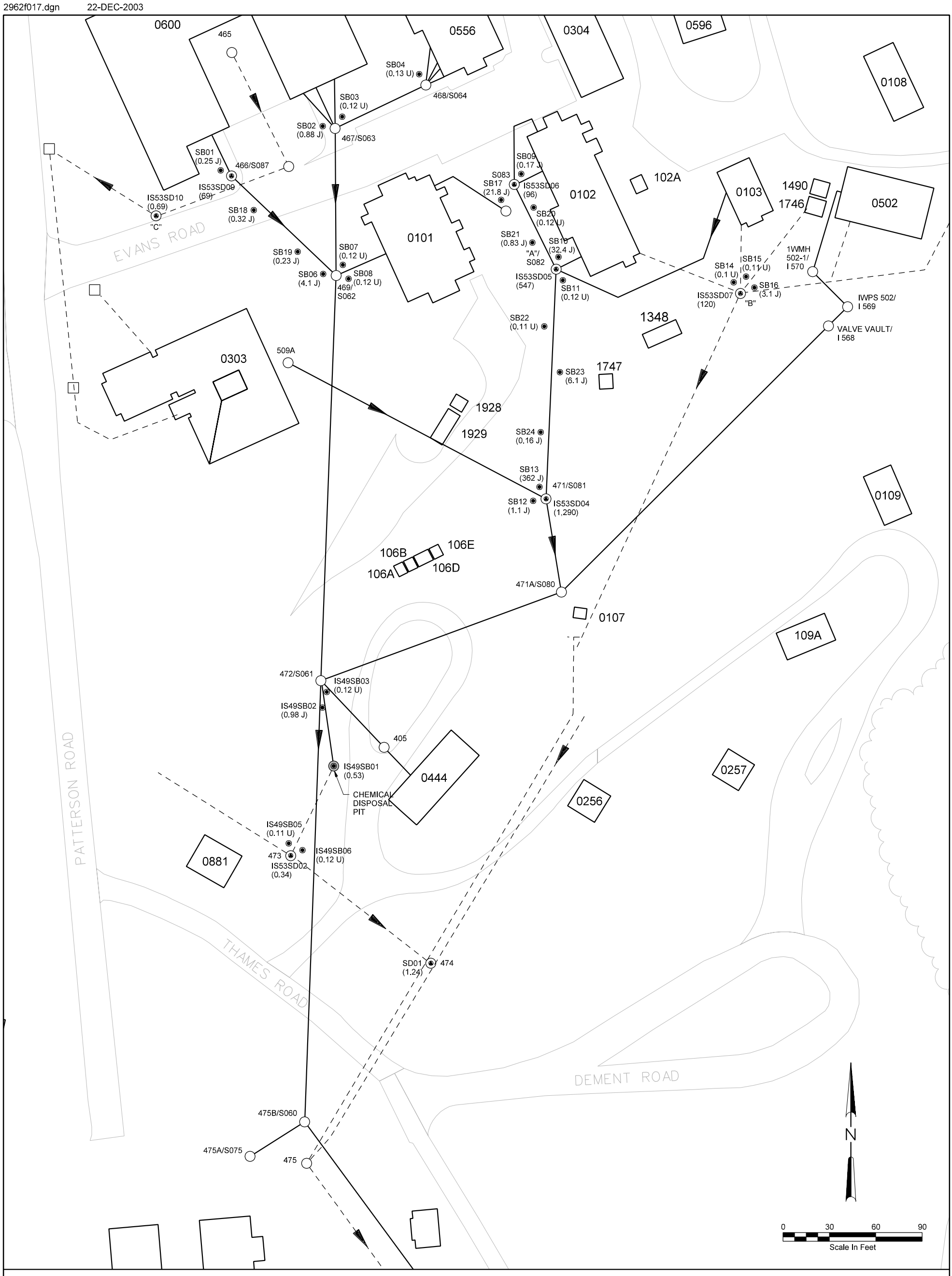
SUBSURFACE SOIL BASE-WIDE BACKGROUND 95% UCL = 17.4 MG/KG
SUBSURFACE SOIL BASE-WIDE BACKGROUND MEAN CONCENTRATION = 12.9 MG/KG

LAB AREA SUBSURFACE SOIL MEAN CONCENTRATION = 30.23 MG/KG
LAB AREA SEWER SEDIMENT MEAN CONCENTRATION = 328.95 MG/KG

FIGURE 3-8
LEAD CONCENTRATIONS IN SUBSURFACE SOIL AND SEWER SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f017.dgn 22-DEC-2003



LEGEND:

- SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL SAMPLE LOCATION
- MANHOLE
- GRATE
- STORM SEWER
- SANITARY SEWER
- (0.34) MERCURY CONCENTRATION IN MG/KG

NOTES:

1. SUBSURFACE SOIL SAMPLE ID FORMAT WOULD BE IS53SB##BDED. BD IS THE BEGINNING DEPTH AND ED IS THE ENDING DEPTH OF THE SUBSURFACE SOIL SAMPLE.
2. SEE APPENDIX A FOR PIPE SIZE AND TYPE.
3. SEVERAL MANHOLES HAVE MULTIPLE DESIGNATIONS AS ASSIGNED IN PAST INVESTIGATIONS.
4. SEWER SYSTEMS SHOWN ONLY IN VICINITY OF SITE 53. ONLY SEWER SEGMENTS AND MANHOLES OF CONCERN ARE SHOWN.
5. FIGURE DEVELOPED FROM BUREAU OF YARDS AND DOCKS, DRAWINGS NO. 670,579 AND 15,699.

U = NOT DETECTED
J = ESTIMATED VALUE
UJ = NOT DETECTED, QUANTITATION LIMIT MAY BE INACCURATE

ALL CONCENTRATIONS IN MG/ KG

HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

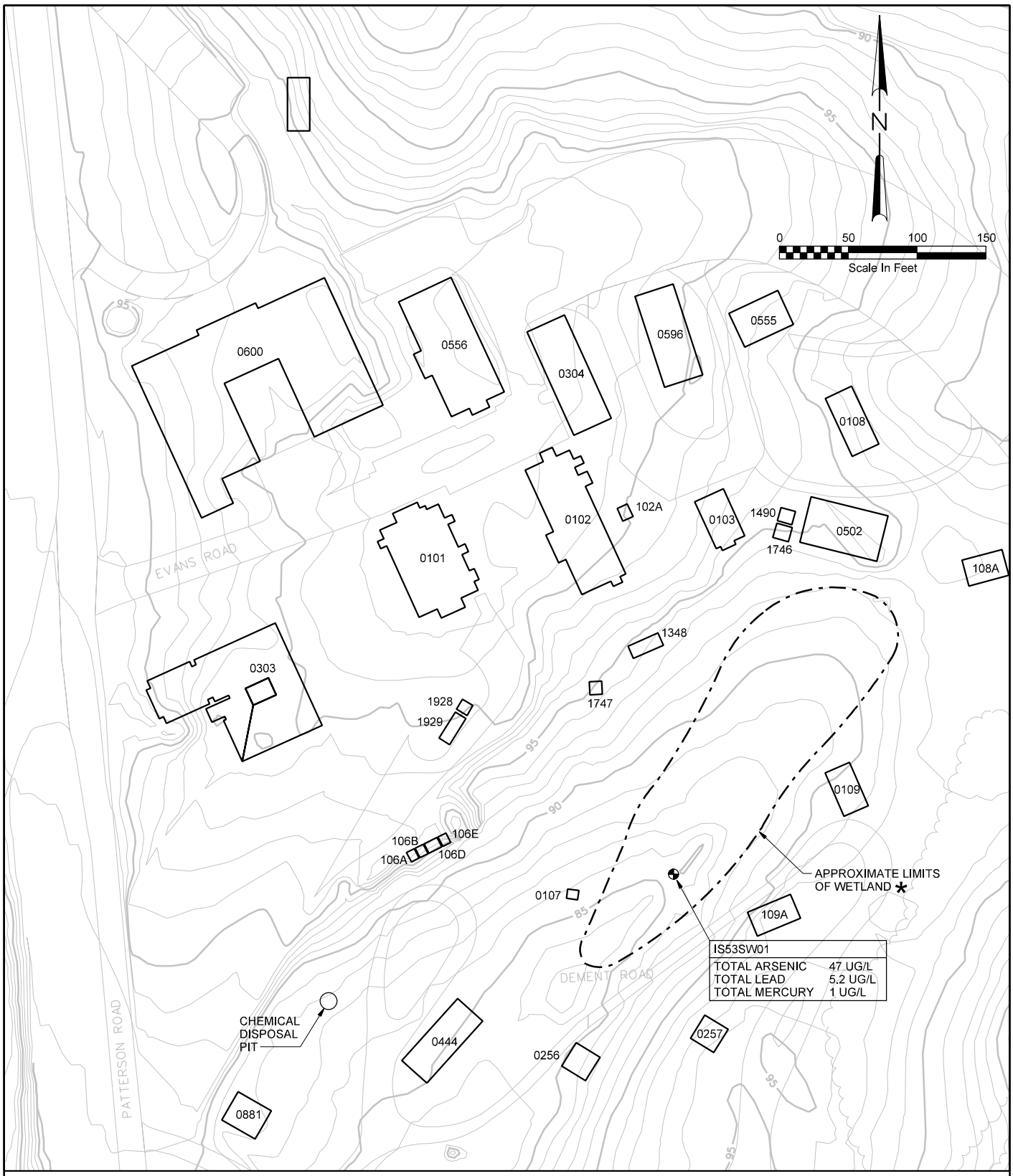
SUBSURFACE SOIL BASE-WIDE BACKGROUND 95% UCL = 0.18 MG/KG
SUBSURFACE SOIL BASE-WIDE BACKGROUND MEAN CONCENTRATION = 0.06 MG/KG

LAB AREA SUBSURFACE SOIL MEAN CONCENTRATION = 15.56 MG/KG
LAB AREA SEWER SEDIMENT MEAN CONCENTRATION = 1,290 MG/KG

FIGURE 3-9
MERCURY CONCENTRATIONS IN SUBSURFACE SOIL AND SEWER SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f018.dgn 22-DEC-2003



LEGEND

SURFACE WATER SAMPLE LOCATION

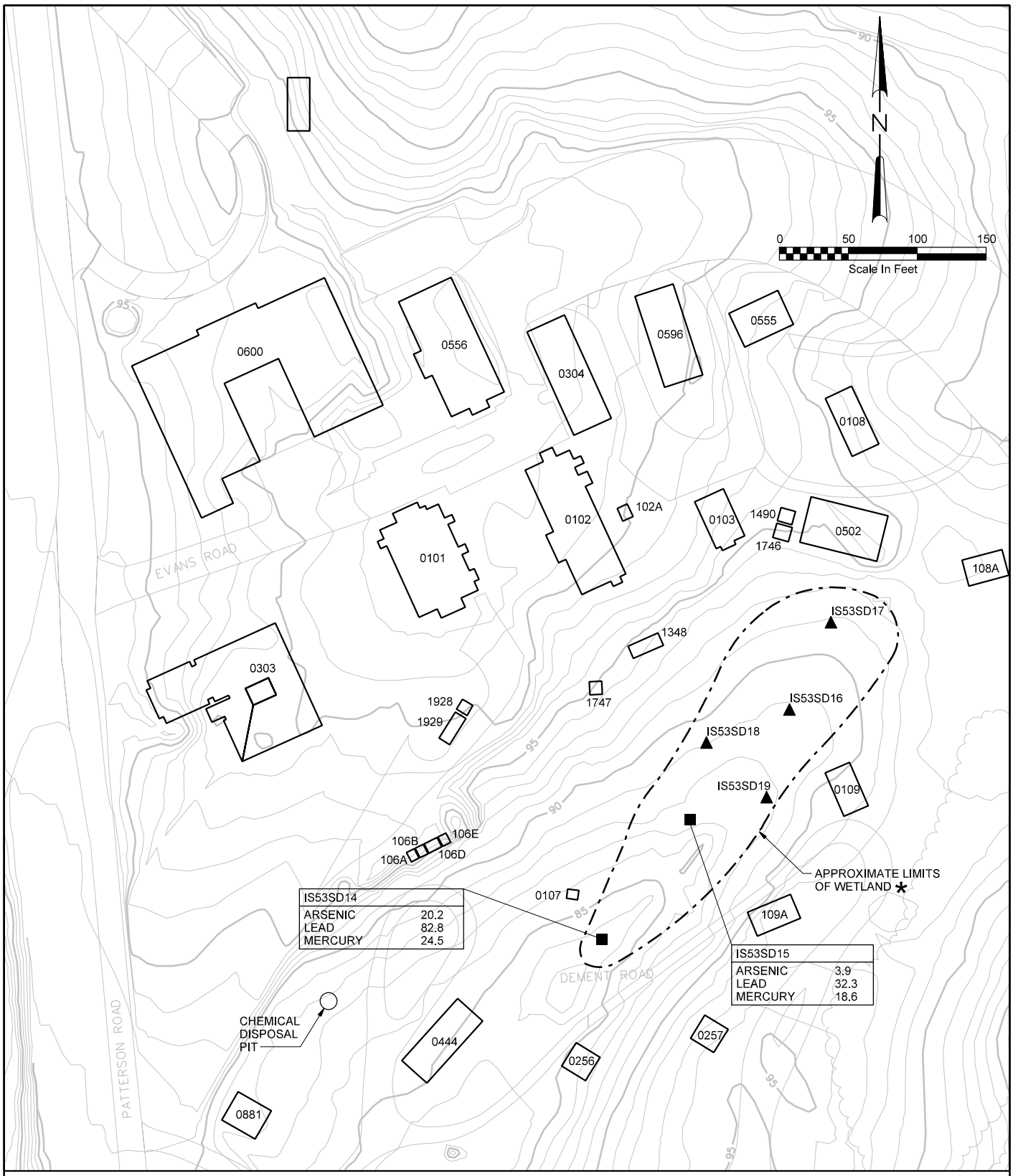
NOTE: NO BACKGROUND DATA AVAILABLE

* ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

Figure 3-10
SELECT INORGANICS IN WETLANDS
SURFACE WATER SAMPLE
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

2962f019.dgn 22-DEC-2003



	ARSENIC	LEAD	MERCURY
FRESHWATER SEDIMENT BASE-WIDE BACKGROUND 95% UCL (MG/KG)	10.6	79.3	0.2
FRESHWATER SEDIMENT BASE-WIDE BACKGROUND MEAN CONCENTRATION (MG/KG)	3.3	23.1	0.07
LAB AREA EMERGENT WETLAND SEDIMENT MEAN CONCENTRATION (MG/KG)	12.05	57.55	21.55

LEGEND

■ SEDIMENT SAMPLE LOCATION

▲ DRY SEDIMENT SAMPLE LOCATION

* ESTIMATED LOCATION OF EMERGENT WETLAND IN MARCH 2001. WETTED AREA CHANGES DEPENDING ON PRECIPITATION AND SATURATION, AS WELL AS THE PRESENCE OF UNDERGROUND LEAKING FRESHWATER PIPES (REFER TO SECTION 1.3.3).

NOTES:

ALL CONCENTRATIONS IN MG/KG

HIGHEST VALUE FROM ORIGINAL SAMPLE OR DUPLICATE SAMPLE IS PRESENTED, WHERE APPLICABLE.

Figure 3-11
SELECT INORGANICS IN WETLANDS SEDIMENT SAMPLES
LAB AREA RI
NDWIH
INDIAN HEAD, MARYLAND

CH2MHILL

SECTION 4

Contaminant Fate and Transport

The fate and transport of chemicals in soil within the Lab Area and how the chemicals may interrelate with the surface water and sediment in the emergent wetland are discussed in this section. The fate and transport are described to support the HHRA and ERA, and to aid in defining remedial alternatives. At the end of this section is a summary of the conceptual model of fate and transport at the Lab Area.

4.1 Contaminant Mobility and Persistence

The probable behavior of the potential contaminants at the site is determined by their physical, chemical, and biological interaction with the environment. The mobility and persistence of the chemicals in the environment are two key characteristics in determining probable behavior. Mobility is the potential for a chemical to migrate from a site, and persistence is a measure of how long a chemical will remain in the environment. Environmental factors that affect the mobility and persistence of the contaminants include: pH, concentration of other chemicals in the media, soil moisture, oxidation-reduction potential (ORP), water chemistry, organic-matter content, and the presence of microorganisms.

The behavior also is determined by the physical and hydraulic properties of the water-bearing units through which the contaminants are being transported. These properties control the advection and dispersion of the contaminants.

4.1.1 Contaminant Groups

Many organic and inorganic constituents were detected in environmental media at the site. The nature and extent of these chemicals are discussed in detail for the different media in Section 3. Discussing the fate and transport of all of these chemicals individually would be cumbersome and repetitive. Instead, because chemicals with similar properties in a group tend to behave similarly in the environment, the mobility and persistence of these chemicals are discussed as groups (e.g., VOCs, SVOCs, explosives, and inorganics), with only occasional reference to particular chemicals as indicators of the behavior of the primary chemicals of interests in the group and likely indicators of the overall group's behavior.

Certain chemicals were selected to represent the range of chemicals associated with the site. The representative chemicals were selected based on concentrations, frequency of occurrence, occurrence in several media, variable migration potential, and likely contribution to overall risk to human health and the environment. The chemicals discussed in this section are listed in Table 4-1 and their specific fate and transport properties are described, below. These properties provide a range of the properties characteristic of each of the chemical groups. Organics were not risk drivers for human health (refer to Section 5), but were still included in this discussion for completeness [although some SVOCs were identified as contaminants of concern (COCs) in the ERA (refer to Section 6)].

4.1.2 Physical and Chemical Properties

Various basic physical and chemical properties affect the transport of chemicals in the environment at the site. Sorption, volatilization, degradation, transformation, and bioaccumulation are considered the most important properties.

Table 4-2 presents data on the physical and chemical properties that are relevant to fate and transport for the representative chemicals. The properties, themselves, are briefly described below. The discussion in this section will focus on behavior of the chemicals in soil, sediment, and surface water, only. Migration of contaminants in groundwater is thought to be insignificant, due to the following: (1) the depth to groundwater was more than 30 ft-bgs to 40 ft-bgs at the Lab Area (E/A&H, 1994); the prevalent silty clays at the Lab Area have extremely low permeability; and (3) the high organic content (and subsequent high adsorptive capacity) in the soil at the Lab Area. Therefore, behavior and properties relating to groundwater will not be discussed in detail.

4.1.2.1 Sorption

Sorption is the tendency for constituents to adsorb to and desorb from materials in the media through which the constituents are being transported. The subsurface materials likely to sorb chemicals typically are clays and organic material, both of which exist in abundance in the environment at the site. In addition, inorganic chemicals adsorb onto iron, manganese, and aluminum oxyhydroxide or oxide coatings on soil and sediment grains. Adsorption of metals can be irreversible because of the process of fixation.

The conventional measure of sorption is the distribution coefficient (K_d) of soil and geologic material for the chemical. The K_d for organic chemicals is the product of an organic carbon partition coefficient (K_{oc}) and the fraction of organic carbon (f_{oc}). In general, chemicals with a K_{oc} greater than 10,000 mg/g, or a log K_{oc} greater than 4 (typical of many SVOCs) tend to have high degrees of adsorption and, consequentially, low mobility; whereas, chemicals with a K_{oc} lower than 1,000 mg/g (typical of many VOCs) have lower degrees of adsorption and, consequentially, higher mobility. A higher K_{oc} also contributes to greater bioaccumulation. The K_d for inorganic chemicals is a complex function of pH, organic content, oxide coatings, CEC, and other factors; therefore, K_d is not easily estimated by methods other than site-specific testing. As shown in Table 4-2, the representative chemicals have a wide range of K_d's.

In order to estimate the K_d of the soil for a particular organic chemical, it is necessary to have an estimate of the total organic carbon (TOC) in the soil. The TOC value, measured in "mg/kg," can be converted to an f_{oc} by dividing by 1,000,000. Site-specific measurements of TOC were collected from approximately 10 percent of the surface soil samples, as well as the four dry sediment samples at the site. The average TOC concentration at the site was approximately 62,308 mg/kg, giving an estimated f_{oc} equal to 0.0623 for the Lab Area. The K_d then was estimated by multiplying the f_{oc} by the K_{oc} (from Table 4-2) for the particular organic chemical (refer to Table 4-3). For inorganics, this simple relationship is not applicable, and site-specific data on K_ds were not collected. Therefore, estimates obtained from the literature were used (refer to Tables 4-2 and 4-3).

As previously discussed, transport through groundwater is not thought to be significant. The migration of contamination through the unsaturated zone is also controlled to some

extent by the degree of absorption. For contaminants detected at the site, it is possible to calculate a retardation coefficient, which is an estimate of the degree to which the contaminant is slowed by adsorption in relation to the groundwater flow velocity or rate of infiltration through the unsaturated zone. The retardation coefficient is calculated according to the following equation:

$$R = 1 + p_b \times K_d / n_e$$

where: R = Retardation coefficient (dimensionless);
p_b = Bulk density (gm/cm^3); and
K_d = Distribution coefficient (ml/gm).

The effect of retardation is estimated by dividing the groundwater flow velocity by the retardation factor, R, which provides a value of migration that is either equal to the flow rate (in the case of no retardation) or less than the flow rate (in the presence of retardation). The higher the retardation factor, the slower a chemical is likely to migrate.

Retardation coefficients for each of the major chemical groups were estimated (refer to Table 4-3). A bulk density of 1.3 grams per cubic centimeter and an effective porosity of 0.50 were assumed for clayey soil (Fetter, 2001). A range of values was calculated to show the effects of the variability in the K_d. Both the range in lower values and the range in upper values of K_d for metals were used, because many metals (e.g., arsenic and mercury) vary widely in their mobility depending upon their valence state. Table 4-3 presents a wide range of retardation coefficient estimates.

The f_{oc}-value used in the calculations of retardation coefficients for organic compounds in Table 4-3 was obtained from the average surface soil sample results (at approximately 10 percent of the locations), as described above, and is not specifically known at each location and depth throughout the Lab Area. Typically, subsurface soil has lower values of TOC than surface soil because of the lower amounts of vegetative material with depth. Therefore, the retardation coefficients estimated using the TOC values from the surface soil might overstate the degree of retardation because the adsorption would be overestimated. As such, the values of retardation for organic compounds should be considered as high-end estimates, and the degree of retardation of organic compounds may be lower. Organics did not appear to have demonstrable risk to human health, and had a seemingly low risk to ecological receptors at the Lab Area. Also, contact of chemicals with groundwater is unlikely.

4.1.2.2 Volatilization

Volatilization is the tendency for some chemicals, particularly VOCs, to change from a liquid or adsorbed state to a gas. Conventional measures of volatility are Henry's Law Constant (K_h) and vapor pressure. Values of K_h and vapor pressures for the representative chemicals are provided in Table 4-2.

Compounds with K_h-values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) (e.g., benzene) are expected to volatilize readily from water to air, whereas those with K_h-values lower than 10^{-5} atm-m^3/M (e.g., benzo[a]pyrene) are relatively non-volatile. Most inorganic chemicals are not volatile under normal temperature and pressure conditions. PCE would be expected to volatilize into the unsaturated soil. PCE was detected at low

concentrations in a small number of samples and is not considered a risk for human or ecological receptors.

Compounds with measurable vapor pressures higher than 10^{-3} millimeters of mercury (mm Hg) can be expected to volatilize readily from their liquid state. Volatilization of mercury from soils may be controlled by temperature, with volatilization from contaminated soils being greater in warmer weather when soil microbial reduction of divalent mercury to the more volatile elemental mercury is greatest (Lindberg et al., 1991).

4.1.2.3 Degradation

Degradation is the transformation of one chemical to another by such processes as hydrolysis, photolysis, and biodegradation. Hydrolysis is the reaction of a chemical with water and photolysis is the result of exposing the chemical to light.

Degradation is commonly expressed as a half-life that composites the degradation by whatever processes may be operating (refer to Table 4-2). For example, in groundwater, di-n-butylphthalate would be expected to degrade much more rapidly than tetrachlorethene, and NC does not readily degrade (even at high temperatures).

4.1.2.4 Transformation

Transformation occurs when metals are increased or reduced in valence state by oxidation or reduction, respectively. Transformation may have a significant effect on the mobility of a metal, either increasing or decreasing it. Transformation can be caused by ORP and pH changes and by microbial or non-microbial (i.e., abiotic) processes. For example, arsenic is more mobile in its trivalent state than in its pentavalent state, and mercury is more volatile in its elemental state than in its divalent state.

4.1.2.5 Bioaccumulation

Bioaccumulation is the extent to which a chemical will partition from water into the lipophilic parts (e.g., fat) of an organism. Bioaccumulation commonly is estimated by the octanol-water partition coefficient (K_{ow}). Chemicals with high values of K_{ow} tend to avoid the aqueous phase and remain in soil longer or bioaccumulate in the lipid tissue of exposed organisms. Accumulation of a chemical in the tissue of the organism can be quantified by a bioconcentration factor (BCF), which is the ratio of the concentration of the chemical in the tissue to the concentration in the water. BCFs are both contaminant-specific and species-specific.

Estimates of the values of K_{ow} for the representative chemicals are provided in Table 4-2. Many inorganic chemicals and SVOCs tend to have higher K_{ow} values, so they bioaccumulate more extensively than VOCs.

4.1.3 Representative Chemicals

The following chemical-specific profiles briefly describe how the chemical and physical properties of the representative chemicals (refer to Table 4-1) affect their mobility and persistence in the environment. Most of the information provided in these profiles was obtained from Spectrum Laboratories chemical fact sheets available at World Wide Web

site: http://www.speclab.com/compound.

4.1.3.1 Tetrachloroethene

PCE was detected at low levels in the shallow subsurface soil (i.e., 0 to 4 ft-bgs) and sewer sediment, but did not exceed any screening criteria (refer to Table 3-2). Releases or spills of PCE on soil typically result in rapid evaporation (due to high vapor pressure) and leaching in soil (due to its low adsorption to soil). PCE exhibits relatively high water solubility, low K_{oc}, and low K_{ow},. Therefore, PCE is expected to be fairly mobile in the soil-groundwater system and does not tend to bioaccumulate. Transport with infiltrating water is expected, particularly in sandy soil and soil having low organic content. Therefore, PCE is not expected to be retained in soil in the first couple of feet, but retained as depth increases. In water systems, evaporation appears to be the most important removal process.

In sewer systems, PCE should evaporate out of the water, and only slightly sorb to sediment. Cracks in manholes and pipes would not allow for migration of PCE if surrounded by tight clay subsurface soil.

Biodegradation may be important under aerobic or anaerobic conditions, but the data are limited. In the environment, PCE degrades to TCE, and then to 1,2-dichloroethene, by reductive dechlorination. Degradation products of PCE were not detected in the Lab Area soil and sediment, with the exception of one detection of TCE in the Chemical Disposal Pit sample.

If PCE is present at a sufficiently high concentration to form a distinct and separate phase from water, it will sink as a dense non-aqueous phase liquid (DNAPL) to a low-permeability layer, underlying a shallow aquifer; however, as previously described, the subsurface conditions at the Lab Area indicate that migration to groundwater is unlikely.

4.1.3.2 Benzo(a)pyrene

Benzo(a)pyrene did not exceed human-health criteria (nor did any other organics); however some PAHs exceeded screening criteria in surface soil at the Lab Area. Low vapor pressure and solubility in water and high K_{oc} and K_d values indicate that benzo(a)pyrene is strongly adsorbed to organic matter in soil. Volatilization would seem to be an insignificant transport mechanism. Transport by groundwater may be limited because of the low solubility and its preference for adsorbing to organic material in soil.

PAHs, such as benzo(a)pyrene, do not contain functional groups that are susceptible to hydrolytic reactions. Therefore, hydrolysis is not a significant degradation process for this compound. Biodegradation of PAHs is well-documented and likely is the ultimate fate of benzo(a)pyrene. Limited nutrient and oxygen availability and the presence of such potential microbe inhibitors as arsenic could limit the effectiveness of biodegradation. PAHs, in general, exhibit short-term bioaccumulation; however, it is not an important process, because of the rapid metabolism and excretion of them by most aquatic organisms.

4.1.3.3 Di-n-butylphthalate

Di-n-butylphthalate did not exceed human-health or ecological risk screening criteria at the Lab Area (refer to Sections 5 and 6). Phthalates is a class of esters that is very common in

industrial use. They are typically used as plasticizers to improve the flexibility of various plastics, or as solvents or insect repellents (Fetter, 1993). Di-n-butylphthalate, along with other organic compounds [e.g., acetone, methylene chloride, toluene, 2-butanone, di-n-octylphthalate, and bis(2-ethylhexyl)phthalate], are also common laboratory contaminants.

Slightly higher vapor pressure and water-solubility, as well as lower K_{oc}-values, indicate that di-n-butylphthalate is not adsorbed to organic matter in soil as strongly as benzo(a)pyrene. Volatilization is a more significant transport mechanism than for benzo(a)pyrene, but the phthalate's Henry's Law constant is similar. Transport through the soil by infiltration could be more of a factor for this compound; however, di-n-butylphthalate should sorb to soil and should not leach appreciably (especially when taking the high f_{oc} clays at the Lab Area into account). The most significant fate process for this phthalate in soil will be biodegradation. Because of its relatively low vapor pressure (i.e., 2.01×10^{-5} mm Hg), evaporation of di-n-butylphthalate from soil is not expected to be significant. Released to water, such as the emergent wetland, di-n-butylphthalate, as well as other phthalates, should partition to solids, such as sediment and biota, due to their range of log K_{ow}s.

Phthalate esters have been identified in living matter, and data collected from studies indicate that they can be taken up and accumulated by a variety of organisms; however, they are most readily degraded by microbiota and metabolized by fish and animals, and therefore, are not expected to biomagnify. Thus, bioaccumulation, biotransformation, and biodegradation are important aquatic fate processes for phthalate esters (SpecLab, 2002).

4.1.3.4 Nitrocellulose

NC was the most prevalent explosive in the Lab Area, although it was only detected in approximately 25 percent of the soil samples, and was not identified as a risk driver for human or ecological receptors (refer to HHRA in Section 5 and ERA in Section 6).

NC is an ester of cellulose with nitric acid, and does not degrade readily, even at boiling temperatures, and is insoluble. The ERA (refer to Section 6) mentioned that NC is relatively non-toxic, and readily undergoes biological degradation when composted in soil piles (at specific concentrations), rendering the NC fines inert. Many studies have shown that elevated levels of NC had no effect on receptors (refer to Sections 5.5 and 6.5); however, significantly high concentrations of NC, including NC in combination with other chemicals (e.g., ether), can cause NC to become unstable. Since NC is fairly insoluble, it would be considered a particulate rather than a dissolved-phase contaminant. Infiltration into the subsurface would be unlikely, as confirmed by the subsurface soil sample results (i.e., NC was only detected in the confirmatory subsurface soil sample under the Chemical Disposal Pit).

4.1.3.5 Arsenic

Arsenic was present in all media at the Lab Area, but only exceeded screening criteria in emergent wetlands sediment (for human receptors). The predominant form of arsenic in oxidizing environments is arsenate (As^{+5}). Under slightly reducing and acidic conditions, such as temporary flooding, the more toxic and mobile arsenite-form (As^{+3}) dominates. Arsenite and methylated arsine predominate in moderately reducing soil, such as tidal marshes and consistently flooded soil. In natural environments, arsenic also may exist in

the negative three (As^{-3}) and zero (As^{0}) valence states, but only under highly reducing conditions.

Transport and partitioning of arsenic (and all other metals) in water depend on the oxidation state of the arsenic and on interactions with other materials that might be present. Organic matter, divalent metals, and dissolved sulfide enhance the reduction of the arsenic valence state to a more mobile form. Soluble forms move with water, but arsenic may be adsorbed from water onto sediment or soil, especially clays, iron oxyhydroxides and oxides, aluminum hydroxides, manganese compounds, and organic material. Adsorption to oxyhydroxides is the most important natural adsorption process.

Microbes are capable of methylating arsenic to trimethylarsine gas, which is a more-volatile and more-mobile form than inorganic arsenic. Bioaccumulation of arsenic occurs in aquatic organisms, particularly algae and lower invertebrates. Although some fish and invertebrates may contain high levels of arsenic compounds, the predominant arsenic form, arsenobetaine, is relatively inert. Biomagnification in aquatic food chains does not appear to be significant.

4.1.3.6 Lead

Lead was present in all media at the Lab Area, but lead was not determined to be a risk to human health for the Lab Area as a whole [i.e., when considering all lead concentrations at the Lab Area to calculate an exposure point concentration for lead (refer to Section 5.4.3)]; however, when considering only the specific portion of the Lab Area around Building's 102, 103, and 304 [where the highest lead concentrations at the Lab Area occurred, as requested by USEPA Region III (i.e., memo from Alvaro Alvarado, Jan. 10, 2003)], the exposure point concentration for lead increased, resulting in a potential risk to human receptors (i.e., hypothetical future child resident and current/future adult female industrial worker) around these buildings through incidental ingestion or inhalation of dust (refer to Section 5.4.3). Note that lead contamination in the Lab Area is not likely a result of a CERCLA release, but rather from weathered lead-based paint (particularly based on the observation that the highest lead concentrations occurred in surface soil samples clustered around buildings).

The dominant species of lead in the aqueous solution is Pb^{+2} under acidic conditions and Pb^{+2}-carbonate complexes under alkaline conditions. Adsorption and precipitation increase with increasing pH, with most lead precipitating out at pH greater than 6. In oxidizing systems, the least soluble common forms of lead are the carbonate, hydroxide, and hydroxy-carbonate. In reducing conditions where sulfur is present, lead sulfide is the stable solid.

Lead dissolves in acid. Due to its very low vapor pressure, volatilization of lead from the soil and water is negligible, although benthic microbes may convert methylate lead to tetramethyl lead, which tends to volatilize to the atmosphere. Lead forms complexes with organic matter and clay minerals that limit its mobility. Only a small fraction of lead in soil will be in a water-soluble form. Lead is effectively removed from water to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (especially as lead sulfide), and the reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates as the process for removing lead from solution. If released into the water, metallic lead will sink into the sediment. Lead may bioconcentrate in fish or other biota.

4.1.3.7 Mercury

Mercury was present in the majority of the samples collected at the Lab Area during this RI (refer to Sections 3.2 through 3.5), and was determined to be a risk for human and ecological receptors (refer to Sections 5.5 and 6.5, respectively).

Two characteristics of mercury distinguish it from other metals: volatility and biotransformation. Its high volatility is a great concern due to its high toxicity. Elemental mercury volatilizes so that much of the mercury in the atmosphere is in atomic form. Some mercury in the atmosphere is associated with particulate matter. Volatile organomercury compounds, such as dimethylmercury, and monomethylmercury salts, are also present in the atmosphere (Manahan, 1990). Mercury in the environment is deposited and revolatilized many times, with a residence time in the atmosphere of at least a few days. Atmospheric mercury can be deposited by both dry and wet deposition (Manahan, 1990). In the volatile phase, mercury can be transported hundreds of kilometers.

Most inorganic compounds of this element are relatively insoluble. In aquatic environments, mercury binds strongly to dissolved matter or fine particulates. Mercury can be desorbed from sediment into the water column. Desorbed mercury in the water column can be transported when bound or chelated to fine particles or dissolved substances. Bryan and Langston (1992) report that the dominant process controlling the distribution of mercury compounds in the environment appears to be this sorption of nonvolatile forms to soil and sediment, with little re-suspension from the sediments back into the surface water.

Mercury concentrations in water and in fish tissue result from the formation of soluble monomethylmercury ion and volatile dimethylmercury by anaerobic bacteria in sediments. Water and sediment in which anaerobic decay is occurring likely contain all the necessary ingredients for producing methylmercury. Mercury in the form of dimethylmercury or monomethylmercury becomes concentrated in fatty tissues (Manahan, 1990). Concentrations in tissue may be as much as 100,000 times the concentrations in water. BCFs of 63,000 for freshwater fish and 10,000 for saltwater fish have been found. Marine plants, invertebrates, and fish have BCFs of approximately 1,000; 100,000; and 1,670; respectively. Freshwater plants, invertebrates, and fish have BCFs of 1,000; 100,000; and 1,000; respectively.

4.2 Contaminant Migration at the Lab Area

This section discusses the site-specific source areas and potential mechanisms for contaminant release and migration from the source areas at the Lab Area. The discussion is organized by media within the site that may experience contaminant transport.

Fundamental to describing fate and transport at the site is the conceptual site model, which is described in this section. The conceptual site model qualitatively defines the various contaminant sources, release mechanisms, relative rates of migration, persistence of contaminants, and migration pathways for contaminants at the site.

One of the objectives of this RI was to determine the rate of migration of site-related contaminants in the environment at the Lab Area (refer to Section 1.1). This objective assumed that contaminant migration in groundwater could be evaluated at the Lab Area; however, as described in Section 1.4.5, depth to groundwater at the Lab Area was more than 40 ft-bgs (E/A&H, 1994). Therefore, migration of contaminants in groundwater at the

Lab Area is thought to be insignificant due to the extremely low permeability, high adsorptive capacity, and high organic content of the silty clays at the Lab Area.

4.2.1 Source Areas and Contaminant Transport Mechanisms

Based on the chemical and physical data gathered for the site and information provided by NDWIH, the following potential contaminant source areas have been identified or may exist at the site:

- Disposal in the former Chemical Disposal Pit of solutions of metals, organic solvents, and possibly other chemicals;
- Surface and subsurface soil contaminated by historic site operations disposal practices (e.g., physical dumping);
- Sewer sediment contaminated by site operations; and
- Emergent wetlands sediment contaminated by site operations;

As noted in the Nature and Extent, HHRA, and ERA Sections (Sections 3, 5, and 6, respectively), inorganic contamination occurs site-wide. Further, inorganic concentrations exceeded background 95 percent UCLs for every inorganic analyte. In particular, arsenic and mercury demonstrated elevated concentrations, and exceeded screening criteria for human and ecological receptors.

The Chemical Disposal Pit was considered a potential contaminant source because historical records indicated that the pit was designed to dispose of laboratory containers without exposing personnel to the contents (refer to Section 1.4.3). The Chemical Disposal Pit was removed (during this RI) for this very reason. Concentration of constituents in the confirmatory samples, or lack there of, suggest that the removal was a success.

Note that since the freshwater pipe that runs below the northern end of the emergent wetland (near the deteriorated sewer line from I568 Pipe Valve to Manhole 471A) was repaired in November 2001, the northern part of the emergent wetland dried up. This broken line was a source of water for the wetland. It is possible that the freshwater leakage caused residual mercury contamination, possibly in or around the sewer line from I568 Pipe Valve to Manhole 471A, to be transported in the dissolved-phase into the emergent wetland. Another freshwater leak possibly feeding the southern end of the emergent wetland was repaired in October 2002.

Another source of water that may maintain the emergent wetland is the steam condensation from the array of steam pipes upslope of the wetland. The wetland is the obvious topographic collection point for surface runoff and overland flow at the Lab Area, so even without a constant water source, contamination would likely continue to be deposited into the sediment.

Section 3 describes the Nature and Extent in the Lab Area. Figure 3-5 presents the concentrations of mercury in the surface soil and dry sediment samples throughout the Lab Area.

The primary mechanisms for contaminant transport from the source areas at the site are as follows:

- Precipitation causing erosion of surface soil from the site and deposition in emergent wetland sediments;
- Precipitation causing leaching of contaminants from the surface soil and transport by surface runoff to the emergent wetland;
- Precipitation causing leaching of contaminants from the surface soil to the subsurface soil;
- Leaching of contaminants from the sewer to the subsurface soil through cracks in the underground pipes and manholes;
- Leaching of contaminants from the sewer to the wetland sediment and surface water through cracks in the underground pipe (line from I568 Pipe Valve to Manhole 471A) and from surrounding contaminated subsurface soil, due to break in underground freshwater pipe(s) in vicinity; and
- Transport of contaminated surface soil (or contaminants in the surface soil) into the air by wind erosion (or volatilization), and subsequent deposition.

4.2.2 Releases from Surface Soil to the Atmosphere

Although releases from the surface soil to the atmosphere are not considered the primary method of release in the Lab Area, they are still valid. Wind erosion and vehicular traffic typically are considered the primary mechanisms for releases of site contaminants to the atmosphere from soil. Inorganics (e.g., lead) and many SVOCs tend to bind to the soil and can be released to the atmosphere as dust during windy conditions or site activities (e.g., soil excavation), followed by deposition downwind at the site or off the site; however, the potential for release of site contaminants to the atmosphere is considered to be minimal since most of the site is either grassed or paved. Additionally, vehicular traffic at the Lab Area does not travel at a speed that would effectively mobilize dust into the air.

Volatilization (which is the primary mechanism for releasing volatile contaminants from soil to the atmosphere) is not considered a significant part of potential contaminant release at the Lab Area for VOCs, since only PCE was detected in surface soil at the Lab Area at low concentrations.

Volatilization of mercury in the Lab Area buildings was an issue during previous investigations. Mercury's volatilization and deposition cycle is mentioned in Section 4.1.3.6, and inhalation of mercury by a current/future industrial worker was determined to be a potential risk at the site [although the potential risk was for the worst-case scenario for an industrial worker exposed to the possible vapors at 8 hours per day for 250 days per year (i.e., the reasonable maximum exposure, rather than the central tendency exposure that would more likely reflect actual expected exposures); refer to Section 5.5.2]. Mercury can volatilize and maintain a residence time for a few days, ultimately being deposited far away from the site; however, mercury concentrations in the soil correlate more with mercury transported overland, as explained in Section 4.2.3.

4.2.3 Releases from Surface Soil to Surface Water and Emergent Wetland Sediment

Releases from the Lab Area surface soil and migration to the emergent wetland sediment and surface water is the primary process for contaminant migration. Source areas are, in general, the surface soil around buildings in the Lab Area, specifically Buildings 102, 103, 304, and 1746, which are located topographically upslope of the emergent wetland.

Although concentrations were not particularly high in the surface water for any contaminant, there is evidence of contaminant accumulation in the emergent wetland, in both the wetland sediment and the dry sediment samples. This contamination was generally inorganic and included arsenic, mercury, and lead, among others. Additionally, organic and inorganic contaminants were found in the surface water and identified as contaminants of concern in the ERA (refer to Section 6.5.3).

In general, overland flow or surface runoff is caused by precipitation events. Although the vegetation in the Lab Area (e.g., grass) minimizes erosion and transport of contaminants, it is possible for contaminants to be transported by surface runoff either in the dissolved phase or as suspended particulates. The load carried by surface runoff is deposited in the emergent wetland as the flow rate declines after a storm. The sediment usually is deposited under oxidizing conditions and, therefore, transported chemicals may be oxidized if the transport times are long enough. This may enhance the mobility of some metals, such as chromium, but reduce the potential transport of others, such as arsenic.

A single VOC (i.e., PCE) was detected in surface soil, but none were at concentrations above acceptable risk levels. Therefore, surface soil at the site is not expected to be a significant source of VOCs in the emergent wetland. This is confirmed by the data since there were no VOCs detected in the wetland surface water or sediment. Many SVOCs (some of which were identified as potential ecological risks) were detected in the surface soil, but only one SVOC (i.e., di-n-butylphthalate) was detected in the sediment. This SVOC was also detected in almost all of the surface soil samples analyzed for SVOCs. All of the inorganics detected in the emergent wetland sediment and surface water were also detected in the surface soil. Wetland sediment contaminant concentrations were not necessarily higher than surface soil concentrations, although the dry sediment sample, IS53SD18, had the highest mercury concentration anywhere in the Lab Area (i.e., 962 mg/kg).

Based on the data and physical site features, the contaminants detected in sediment in the emergent wetland were derived from the upslope surface soil on the site.

4.2.4 Releases from Surface Soil to Subsurface Soil

Percolation of precipitation, both rainfall and snowmelt, through the unsaturated soil can dissolve contaminants and strip them from the soil, then transport them to the underlying soils and, eventually, groundwater. Thus, surface soil can serve as a source of contaminants to subsurface soil, and surface soil and/or subsurface soil can serve as sources of contaminants to groundwater.

As explained in Section 4.1.2.1, the Lab Area soils have high adsorptive capacity for most contaminants, especially for the metals and SVOCs identified as COCs in the HHRA and ERA. Therefore, contaminant transport to groundwater is unlikely, but transport from

surface soil to the more permeable subsurface soil (by infiltration) within 4 ft-bgs across the site is possible.

Contamination was present in the subsurface soil, generally within 4 ft-bgs. Contamination that was found in the deep subsurface was located in sewer bedding, likely from sewer leakage rather than surface infiltration (refer to Section 3.3); however deep subsurface soil samples were collected only near sewer and manhole locations.

NC is insoluble in water, but many of the VOCs, SVOCs, and inorganics in question are soluble in water. Table 4-4 presents the soil-screening levels (SSLs) proposed by USEPA (1996) for protection of groundwater from soil contamination for the representative chemicals. The SSLs listed assume a dilution-attenuation factor (DAF) in the groundwater of 1, the most conservative assumption possible (as compared to the more common DAF of 20). PCE was detected during the RI at concentrations that exceeded its SSL, both in surface and subsurface soil, while benzo(a)pyrene was detected during the RI at concentrations that exceeded its SSL in surface soil, only (since it was not detected in subsurface soil). Both arsenic and mercury were detected at concentrations that exceeded their respective SSLs, both in surface and subsurface soil. Therefore, there would be a potential that organics and inorganics could continue as sources of contamination to groundwater (from surface and subsurface soil); however, as previously discussed, this is not thought to be a significant release mechanism in the Lab Area.

4.2.5 Releases from Sewer Sediment to Subsurface Soil

Cracks in pipes and manholes within the Lab Area were the original concern for this RI. Most of the pipes were inspected by video survey, and some were repaired (i.e., relined), as described in Section 1.4.5.

Section 3.3 describes the contamination in the sewers and subsurface soil at the Lab Area. There is some correlation between contaminants in sewers and/or manholes and the surrounding subsurface soil. Organics and explosives detections in sewer sediment and subsurface soil were low and infrequent; however, detections of inorganics in both the sewer sediment and surrounding subsurface soil at elevated levels defined some hot spots.

Twenty-two inorganic analytes were detected in the subsurface soil samples collected from the pipe bedding in the Lab Area, while 24 were detected in the sewer sediment (refer to Table 3-3). Arsenic, calcium, copper, iron, lead, mercury, potassium, sodium, vanadium, and zinc were all detected above facility-wide background 95 percent UCLs in one or more subsurface soil samples (refer to Table 3-2 and Table G-2). Elevated concentrations of mercury in the sewer sediment and corresponding surrounding subsurface soil were the expected indicators.

Mercury was detected in 16 out of 28 subsurface soil samples and all 8 of the sewer sediment samples (refer to Table 3-3 and Figure 3-9). Concentrations in the subsurface soil ranged from 0.16 mg/kg to 362 mg/kg, while concentrations in the sewer sediment ranged from 0.34 mg/kg to 1,290 mg/kg. The maximum mercury concentration of 362 mg/kg in the subsurface soil was located beside Manhole 471, which contained the maximum sewer sediment mercury concentration of 1,290 mg/kg. Manhole 471 services Building 303 and receives flow from Manhole A, which services Buildings 102 and 103. Similarly, the sediment mercury concentration in Manhole A (i.e., 547 mg/kg in sewer sediment sample

IS53SD05) correlated with its associated subsurface soil sample (i.e., IS53SB10) mercury concentration of 32.4 mg/kg. Both of these manholes were recently refurbished, and 1 pound of mercury was removed from Manhole A (which serves Buildings 103 and 102) in 1989. Since the manholes were refurbished, the sediment in the manholes should not be a continuing source to the subsurface soil through cracks in the manholes; however, the sewer line between Manholes A and 471 is known to be in poor condition (refer to page 10 in Appendix A).

Overall, every sediment sample demonstrated elevated levels of mercury, with some correlation to subsurface soil samples associated with the manholes, suggesting that mercury contamination in the subsurface soil occurred because of deteriorated piping and manhole connections. Mercury could discharge to surrounding subsurface soil as dissolved-phase or adsorbed to particulate matter, depending on the chemical conditions at each location, the amount of sewage flowing, and the pressure of sewage or water flow. It is not likely that contamination (that could leak out of manholes or sewer pipes into surrounding subsurface soil) would migrate far away from each location, other than through existing bedding material (although, no bedding material was actually encountered during this investigation). This is due to the low permeability subsurface clay, with high f_{oc}, that surrounds any possible existing bedding material. It is also not likely that contamination in the subsurface soil would migrate into the sewer pipes or manholes, specifically due to the lack of groundwater and hydraulic head that would be required to create such a gradient.

4.2.6 Releases from Wetland Sediment to Wetland Surface Water

Releases of constituents from contaminated emergent wetland sediment could occur by dissolution or provocation of suspended particulate matter. Di-n-butylphthalate was the only organic compound detected in emergent wetland sediment, although other SVOCs and explosives were detected at low levels in two of the dry sediment samples. Dissolution and suspended particulate proliferation would depend on many factors, including the degree of sediment agitation, the amount of vegetation and organic matter present, residence time of surface water, the flow rate through the emergent wetland, as well as chemical variability.

Concentrations in the sediment were not as elevated as expected. The HHRA identified arsenic as the only risk in the emergent wetland sediment (refer to Section 5.7), while the ERA identified arsenic, lead, manganese, mercury, and silver (refer to Section 6.5.3.3). The HHRA did not identify any contaminants in the surface water as risk drivers, yet the ERA identified aluminum, copper, cyanide, iron, lead, manganese, and mercury. All contaminants detected in the sediment were also in the surface water. Cyanide was not detected in the emergent wetland sediment, but was detected in the surface water. No surface water concentrations were determined to be risk drivers for human or ecological receptors. Therefore, it seems that the saturated channel does not contain significant levels of contaminants that will transfer to the surface water. During a large precipitation event, when more of the emergent wetland is saturated and submerged, the dry sediment locations (where the mercury concentration was the highest) would likely contribute to surface water contamination.

4.2.7 Releases from Sewer Sediment to Wetland Surface Water and Wetland Sediment

A freshwater line that runs under the northern edge of the emergent wetland has provided considerable water to the wetland. The freshwater was thought to have been leaking at over 30 gallons per minute, causing considerable pressure in the subsurface. This amount of water and pressure may have captured some of the mercury that was potentially present within or just outside of the sewer line (from I568 Valve Vault and Manhole 471A), and perhaps deposited it in the emergent wetland. Various forms of mercury could be transported by dissolution or entrainment of mercury-adsorbed suspended particulates. The broken pipe was repaired in November 2001, likely preventing this from occurring in the future. Another freshwater leak possibly feeding the southern end of the emergent wetland was repaired in October 2002. Following the pipe repairs, portions of the wetland have begun to dry up, thereby reducing or potentially eliminating this transport pathway.

4.2.8 Summary and General Conceptual Model of Contaminant Transport

Various SVOCs and inorganics were identified as potential risks to both human and/or ecological receptors in surface soil, subsurface soil, wetlands sediment, and surface water. Most of the contamination was inorganic, specifically arsenic, lead, and mercury in the surface soil, subsurface soil, and sediment within the Lab Area (although lead contamination is not likely a result of a CERCLA release, but rather from weathered lead-based paint). Some SVOCs were ecological risk drivers in the wetland sediment and surface water.

For the most part, the buildings, themselves, and surrounding surface soil in the Lab Area are the sources of the contamination, particularly for lead and mercury. Lead, mercury, and arsenic hotspots may be discerned from Figures 3-3 through 3-5: the surface soil in the vicinity of Buildings 102, 103, 303 (i.e., the southern side of Building 303 around surface soil sample IS53SS57), and 1746, as well as the areas around dry sediment sample IS53SD18. Inorganics from these areas, as well as other parts of the Lab Area, would be transported mostly by overland flow and surface runoff. This would likely occur during precipitation events, and each contaminant could be transported by either dissolution into the surface runoff or entrainment of particulates with adsorbed contaminants. The grass in the Lab Area typically prevents eroded paths and inhibits this migration; however, elevated levels of organics and inorganics in the emergent wetland suggests that this migration does occur over time.

Groundwater has not been encountered at the Lab Area during any environmental investigation, and advective flow within the subsurface clay is not thought to be a significant mechanism for transport.

Subsurface soil hotspots seem to be around the recently refurbished Manholes A and 471, mostly for mercury and lead. Migration of contaminants away from these spots is unlikely due to the high f_{oc} subsurface clay at the Lab Area; however, some migration is possible through sewer pipe bedding (i.e., if sewer pipe bedding exists), and in the sewers, themselves. This is supported by data sets from previous investigations and this RI, which indicate that contamination is closest to underground pipes and manholes.

The Lab Area currently uses appropriate disposal methods of various chemicals and contaminants, preventing further contamination (e.g., mercury traps, vapor hoods, etc.).

Additionally, some of the more damaged pipes and manholes, as determined by inspections and previous video surveys, were relined and/or replaced, refurbished, or repaired.

4.3 References

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Table 4-1
Representative Constituents
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Volatile Organic Compounds
Tetrachloroethene
Semivolatile Organic Compounds
benzo(a)pyrene
Di-n-butylphthalate
Explosives
Nitrocellulose
Inorganics
Arsenic
Lead
Mercury

Table 4-2
Physical, Chemical, and Half-Life Data of Representative Chemicals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, MD

Constituent	Molecular Weight (g/mole)	Specific Gravity (unitless)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m^3/mole)	K_d or Log K_{oc}[1] (mg/g)	Log K_{ow} (ml/g)	Half-Life Range (days)			
								Soil		Surface Water	
								Low	High	Low	High
Volatile Organic Compounds											
Tetrachloroethene	165.83 (1)	1.62 (1)	150 (1)	14 (1)	0.0153 (1)	2.42 (1)	2.60 (1)	183 (2)	365 (2)	365 (2)	730 (2)
Semivolatile Organic Compounds											
Benzo(a)pyrene	252.32 (1)	1.35 (1)	0.003 (1)	5.6E-09 (1)	<2.4E-06 (1)	5.60 (1)	6.50 (1)	57 (2)	529 (2)	<1 (2)	<1 (2)
Di-n-butylphthalate	278.35 (5)	1.04 (6)	11.2 (5)	2.01E-05 (5)	1.81E-06 (5)	4.10 (7)	4.50 (5)	2 (2)	23 (2)	1 (2)	14 (2)
Explosives											
Nitrocellulose	Not available	Not available	Insoluble	Not available	Not available	Not available	Not available	Not available	Not available	Not available	Not available
Inorganics											
Arsenic	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	20 - 70 (4)	Uncertain	*Inorganics do not degrade*			
Lead	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	4.5 - 7,640 (4)	Uncertain	*Inorganics do not degrade*			
Mercury (elemental)	200.59 (6)	13.546 (6)	0.06 (10)	0.002 (6)	0.467 (10)	5.53 (7)	5.94 (9)	*Inorganics do not degrade*			

[1] K_d for inorganics and log K_{oc} for organics; K_d = Distribution coefficient; K_{oc} = Organic carbon partition coefficient; K_{ow} = Octanol-water partition coefficient

Uncertain = No value is provided because of the uncertainty in the form of this chemical in the environment. Properties are "affected by numerous geochemcial parameters and processes, including pH; sorption to clays, organic matter, iron oxides, and other soil constituents; oxidation/reduction conditions; major ion chemistry, and the chemical form of the metal (USEPA, 1996)."

g/mole = grams per mole; mg/l = milligrams per liter; mm Hg = millimeters of mercury; atmospheres-cubic meters per mole (atm-m^3/mole); milligrams per gram (mg/g); milliliters per gram (ml/g)

Data sources:

(1) Montgomery and Welkom. 1989. Groundwater Chemicals Desk Reference. Volume 1.
(2) Howard, Ph. H. et al. 1991. *Handbook of Environmental Degradation Rates.*
(3) Region III BTAG Screening Levels. Interim Draft, 1/19/95
(4) USEPA. 1996. Soil Screening Guidance: Technical Background Document. May 1996, EPA/540/R95/128.
(5) SRC PhysProp Database at http://esc.syrres.com/interkow/physdemo.htm
(6) ChemFinder Database at http://chemfinder.cambridgesoft.com
(7) Calculated using Karckhoff (1981): log(Koc) = 0.989*log(Kow) - 0.346, using 4.50 for log(Kow)
(8) Calculated using Karckhoff (1981): log(Koc) = 0.989*log(Kow) - 0.346, using 5.94 for log(Kow)
(9) Agency for Toxic Substances and Disease Registry, 2002.
(10) Toxicity and Chemical-Specific Factors Database, 2002.

Table 4-3
Retardation Coefficients for Representative Chemicals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, MD

Constituent	Log K_{oc}	K_d	Retardation Coefficient
VOCs			
Tetrachloroethene	2.42	16.4	44
SVOCs			
Benzo(a)pyrene	5.60	24,802.1	64,486
Di-n-butylphthalate	4.10	784.3	2,040
Explosives			
Nitrocellulose	--	--	--
Inorganics			
Metals (Low range)	--	60 - 2,252	157 - 5,856
Metals (High range)	--	525 - 8,257	1,367 - 21,468
Mercury (elemental)	5.53	21,110	54,887

Notes and Abbreviations

K_{oc} = Organic carbon partition coefficient

K_d = Distribution coefficient

R = Retardation coefficient = $1 + K_d \times p_b / n_e$

p_b = Soil bulk density = 1.3 grams per cubic centimeter for clay (Fetter, 2001)

n_e = Effective porosity = 0.50 for clay (Fetter, 2001)

For organics, $K_d = K_{oc}$ x fraction of organic carbon, estimated to be 0.0623, as calculated by f = (Average TOC concentration at the site in mg/kg) / 1,000,000

Table 4-4
Leaching-Based Soil Screening Levels for Representative Chemicals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Constituent	Soil-Screening Level (mg/kg)
VOCs	
Tetrachloroethene	0.0014
SVOCs	
Benzo(a)pyrene	0.4
Di-n-butylphthalate	12
Explosives	
Nitrocellulose	--
Inorganics	
Arsenic	0.0013
Lead [1]	400
Mercury	0.3

Notes and Abbreviations

mg/kg = milligrams per kilogram

SSL = Soil Screening Level

SSLs are from USEPA Region III Risk Based Concentration Table (April 2002), assuming a dilution-attenuation factor of 1

[1] SSL for lead is 400 ppm, based on USEPA OSWER Directives from 1994 and 1998:
- USEPA 1994. OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. USEPA August 1994, EPA/540/F-94/043 [OSWER Directive # 9355.4-12].
- USEPA 1998. OSWER Directive: Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. USEPA August 1998, EPA/540/F-98/030 [OSWER Directive #9200.4-27P].

SECTION 5

Baseline Human-Health Risk Assessment

5.1 Introduction

This section presents the results of an assessment of potential human health risks associated with the presence of site-related soil, surface water, and sediment contamination at the Lab Area at NDWIH, Indian Head, Maryland. The Lab Area is a grouping of adjacent Sites 15, 16, 49, 50, 53, 54, and 55 at NDWIH (refer to Figure 1-2). This HHRA evaluates the Lab Area using the following groupings of sites:

- ***Lab Area Underground Sewer Lines***, which consists of the subsurface soil and sewer sediment within the Lab Area, and
- ***Lab Area Surface Soil and Wetland Area***, which consists of the surface soil, wetland area sediment, and wetland area surface water within the Lab Area.

Analytical results from soil, subsurface soil, surface water, and sediment were used to examine the potential human health risks.

This baseline risk assessment, which characterizes the human health risks at the Lab Area if no additional remediation is implemented, was conducted to assess the potential human health impacts from the site under current conditions, as well as to determine if any further actions are needed at the site to be sufficiently protective of human health. This risk assessment has been prepared utilizing conservative assumptions, and all feasible exposure pathways have been considered based on current site conditions and current and potential future site usage. The HHRA incorporates the general methodology described in *Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual, Part A* (USEPA, December 1989); *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part D* (USEPA, December 1997); and USEPA Region III Technical Guidance Manuals for Risk Assessment.

The results of the Lab Area baseline HHRA will be used to help determine whether remediation is necessary, to document the potential for endangerment to human health, to provide a basis to select action levels, and to assist in identifying the exposure media that may need to be addressed through remedial action.

5.1.1 Overview

5.1.1.1 Lab Area Underground Sewer Lines

The Lab Area Underground Sewer Lines run underground near buildings in the northwest, central western, central eastern, and southwestern part of the Lab Area (Figure 2-3). Section 1.4 describes the history and previous investigations of subsurface soil and sewer sediment conducted in the Lab Area. Subsurface soil and sewer sediment sampling activities that occurred during this RI to support this HHRA are described in Section 2,

nature and extent of contamination are summarized in Section 3, while fate and transport of chemicals within the Lab Area are described in Section 4.

5.1.1.2 Lab Area Surface Soil and Emergent Wetland Area

The Lab Area Surface Soil and Wetland Area consists of the surface soil across the entire Lab Area and the emergent wetland area in the southeastern portion of the Lab Area (refer to Figure 2-1). Section 1.4 describes the history and previous investigations of the surface soil conducted in the Lab Area. This RI is the first comprehensive environmental investigation of the surface soil in the Lab Area as a whole (including the emergent wetland area). Surface soil and emergent wetland area sampling activities to support this HHRA are described in Section 2, nature and extent of contamination are summarized in Section 3, and fate and transport of chemicals within the Lab Area are described in Section 4.

5.1.2 Scope of Risk Assessment

The HHRA for the Lab Area is comprised of the following components:

- **Identification of Chemicals of Potential Concern (COPCs) -** identifies and characterizes the distribution of COPCs found onsite for the different area groupings. Chemicals identified in this screening are the focus of the subsequent evaluation in the risk assessment.
- **Exposure Assessment -** identifies potential pathways by which exposure could occur, characterizes the potentially exposed populations (e.g., industrial workers, construction workers, trespassers), and estimates the magnitude, frequency, and duration of exposures.
- **Toxicity Assessment -** identifies the types of adverse health effects associated with exposure to COPCs, lists available toxicity factors (e.g., cancer slope factors and reference dose values), and summarizes the relationship between magnitude of exposure and occurrence of adverse health effects. It also identifies related uncertainties (e.g., the weight-of-evidence for carcinogenicity of a particular chemical in humans) associated with these values.
- **Risk Characterization -** integrates the results of the exposure assessment and toxicity assessment to estimate the potential risks to human health. Both cancer and noncancer human health effects are evaluated. Pathways that pose an unacceptable risk based on quantitative risk characterization are identified.
- **Uncertainty Assessment -** identifies sources of uncertainty associated with the data, methodology, and the values used in the risk assessment estimation.

These components are described briefly in the following sections. Tables prepared in accordance with USEPA RAGS Part D were used to screen for COPCs and to calculate estimated exposures and health risks associated with the COPCs. These tables are presented in Appendices H and I.

5.2 Identification of Chemicals of Potential Concern

The identification of COPCs includes data collection, data evaluation, and data screening steps. The data collection and evaluation steps involved gathering and reviewing the available site data and identifying a set of data that was of acceptable quality for the risk assessment. This data set was then further screened against concentrations that are protective of human health to reduce the data set to those chemicals and media of potential concern. The data used for the quantitative risk analysis were all validated and met data quality objectives (DQOs) prior to use in the risk assessment.

Section 5.2.1 discusses the selection of data used for the quantitative risk assessment. The data were selected from the set of validated data determined usable for risk assessment. Section 5.2.2 discusses the methodology used to further reduce the risk assessment data set to the constituents and media which are of primary concern to human health. Section 5.2.3 identifies the COPCs that were quantitatively assessed in the risk assessment.

5.2.1 Data Evaluation and Selection

The field investigations conducted during this RI generated information on the Lab Area contaminants. Data are available for contaminant levels in soil, subsurface soil, surface water, and sediment (refer to Section 3). Data used in the risk assessment are also presented in this section. Tables 5-1 and 5-2 summarize the samples that were used to estimate potential exposures and risks in each medium (i.e., surface soil, subsurface soil, surface water, and sediment) for the *Lab Area Underground Sewer Lines* and the *Lab Area Surface Soil and Wetland Area*, respectively. Past efforts and investigations in the Lab Area, namely the 1992 SI (E/A&H, 1994), indicated that the depth to groundwater exceeded 30 to 40 feet in the Lab Area, and that soil conditions at the site would inhibit the migration of contamination (refer to Section 1.4.5). This RI also determined the absence of a shallow water-bearing zone and the presence of clay starting at 4 ft-bgs throughout the Lab Area (refer to Sections 2, 3.3, and 4.1.2). Therefore, groundwater was not evaluated in this risk assessment.

As stated in the *Methods for Preparing the Human Health Risk Assessment for Indian Head* (CH2M HILL, October 15, 2001), the RI soil, subsurface soil, surface water, and sediment data that were fully validated and met DQOs were used in the quantitative risk assessment.

Available data were reviewed to determine their reliability for the quantitative risk assessment. The following bullets discuss how validated, qualified data were evaluated in the risk assessment, as well as additional data handling and evaluation issues (also see Data Quality Assessment in Section 3.1):

- Estimated values qualified with a “J,” “K,” or “L” were treated as unqualified detected concentrations.
- Data qualified with an “R” (rejected) were not used in the risk assessment.
- Data qualified with a “B” (blank contamination) were used in the risk assessment as if they were non-detect and one-half the practical quantitation limit, or the USEPA’s CRDL, was used as the sample concentration.

- One-half of the CRDL was used in the risk assessment for cases where no detectable contaminant quantities were found in that sample, but the contaminant was detected in that medium for that data grouping.
- For duplicate samples, the higher of the two concentrations was used. In calculating the frequency of detection and the 95 percent UCL of the mean, the duplicates were counted as a single sample.
- Analytes for which no positive results were reported for a particular medium for a data grouping were not considered contaminants of potential concern for that medium.

5.2.1.1 Data Summary

All of the data used in this HHRA were fully validated and were assumed to represent current conditions. Analytical data from soil, subsurface soil, surface water, and sediment used in this HHRA are presented in this section. Data collected during previous sampling efforts were used to determine the media and constituents that were analyzed during this RI. Data collected during this RI were used in this HHRA to determine chemical-specific summary statistics used in the quantitative risk calculations. For each medium in each data grouping, chemical-specific summary statistics for the data set used for risk calculations are presented in Appendices H and I (for the *Lab Area Underground Sewer Lines* and the *Lab Area Surface Soil and Wetland Area*, respectively). These summary statistics include frequency of detection, minimum and maximum detected values, normal and log-normal arithmetic mean, normal and log-normal standard deviation, results of W-test, and 95 percent UCL for normal and log-normal distribution. Methods for calculating exposure point concentrations, arithmetic means, and the 95 percent UCL values for detected chemicals are discussed in Section 5.3.3.

5.2.1.2 Subsurface Soil

Table 5-1 summarizes each sample (and the corresponding analyses) evaluated in the HHRA for the *Lab Area Underground Sewer Lines*. Raw, validated analytical results for the subsurface soil samples are presented in Appendix E. Statistical summaries of constituents detected in subsurface soil are presented in Tables 2.1 and 2.2 of Appendix H**.**

5.2.1.3 Surface Soil

Table 5-2 summarizes each sample and the corresponding analysis for the *Lab Area Surface Soil and Wetland Area*. Raw, validated analytical results for the surface soil samples are presented in Appendix E. A statistical summary of constituents detected in surface soil is presented in Table 2.1 in Appendix I.

Note that the two site-specific background surface soil samples (i.e., IS53SS77 and IS53SS78) were inadvertently included in the data set used to evaluate risks associated with exposure to surface soil in the *Lab Area Surface Soil and Wetlands Area* data grouping; however, their inclusion will not affect the results of the risk assessment significantly. Inclusion of these samples in the data set may result in a slightly lower exposure point concentration than if they were not included (refer Section 5.3.4.1 and Sections 5.5 through 5.7), which would result in slightly lower calculated noncarcinogenic hazards and carcinogenic risk (refer to Section 5.5.1). The noncarcinogenic hazards to current/future industrial workers, future construction workers, and future child and adult residents exceed USEPA's target hazard

level with the inclusion of these samples (refer to Section 5.7). Removing these samples would only result in hazards slightly above those calculated, which are already above USEPA's target levels.

5.2.1.4 Sediment

Table 5-1 summarizes each sample evaluated in the HHRA for the *Lab Area Underground Sewer Lines* (and the corresponding analyses), while Table 5-2 summarizes each sample (and the corresponding analyses) for the *Lab Area Surface Soil and Wetland Area*. Raw, validated analytical results for the sewer sediment samples, emergent wetland sediment samples, and emergent wetland dry sediment samples are presented in Appendix E. Statistical summaries of constituents detected in sewer sediment samples are presented in Tables 2.3 and 2.4 in Appendix H; a statistical summary of constituents detected in emergent wetlands sediment samples is presented in Tables 2.3 in Appendix I; and a statistical summary of constituents detected in emergent wetlands sediment samples is presented in Table 2.1 (with the surface soil samples) in Appendix I.

5.2.1.5 Surface Water

Table 5-2 summarizes each sample and the corresponding analysis for the *Lab Area Surface Soil and Wetland Area*. Raw, validated analytical results for the wetland surface water sample are presented in Appendix E. A statistical summary of constituents detected in surface water is presented in Table 2.4 in Appendix I.

5.2.2 Selection of Chemicals of Potential Concern

All of the detected constituents were screened in accordance with USEPA Region III guidelines (USEPA, January 1993), using the steps described below. The COPC selection process was conservative to ensure selection of the constituents comprising most of the potential risk associated with each area. The maximum detected concentration of each constituent in each medium (for each area) was compared to a screening value to select the COPCs for the media. If the maximum concentration of a constituent exceeded the screening value, the constituent was selected as a COPC and retained for the risk evaluation.

5.2.2.1 Based on Comparison with Health-Based Criteria for Soil

The maximum detected chemical concentrations in soil were compared with current RBCs for residential soil (USEPA, October 2002). RBCs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as presented in the RBC Table (USEPA, October 2002). Constituents with maximum detected concentrations below the RBCs were not retained as COPCs. Lead concentrations in soil were compared to the USEPA residential child soil screening value of 400 ppm, as determined using the Integrated Exposure Uptake Biokinetic (IEUBK) Model. If the lead concentration exceeded the screening value, it was evaluated quantitatively for the residents using IEUBK model and for the site worker using the adult lead model (refer to Appendix J).

5.2.2.2 Based on Comparison with Health-Based Criteria for Air

Air concentrations estimated from maximum detected soil concentrations using the methodology presented in USEPA's Soil Screening Guidance (USEPA, May 1996) were

compared with current ambient air RBCs (USEPA, October 2002). RBCs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as presented in the RBC Table (USEPA, October 2002). Volatile and particulate constituents with calculated air concentrations below RBCs were not retained as COPCs for the soil to air pathway.

5.2.2.3 Based on Comparison with Health-Based Criteria for Surface Water

RBC values are not available for surface water, and tap water RBCs are based on exposure assumptions that are not applicable for contact with surface water. Therefore, screening of COPCs in surface water was based on comparison of maximum detected surface water concentrations to 10 times the tap water RBCs. The use of 10 times the tap water RBC is a conservative estimate assuming that a receptor is in contact with surface water at much lower exposure parameters (i.e., ingestion rate, skin surface area, exposure frequency, and exposure duration). RBCs that are based on noncarcinogenic effects were used as presented for tap water in the most current RBC table (EPA, October 2002). RBCs based on carcinogenic effects were 10 times the current EPA Region III RBCs for tap water. Constituents having a maximum detected concentration less than the lowest adjusted tap water RBC were not retained as surface water COPCs for the HHRA. Lead concentrations in surface water were compared to the Safe Drinking Water Act action level of 15 mg/L. If the lead concentration exceeded this screening value, it was discussed qualitatively in the toxicity assessment section.

5.2.2.4 Based on Comparison with Health-Based Criteria for Sediment

RBC values are not available for sediment, and residential soil RBCs are based on exposure assumptions that are not applicable to contact with sediment. Therefore, screening of COPCs in sediment was based on the comparison of maximum detected sediment concentrations to 10 times the RBC for residential soil. Similar to surface water, the use of 10 times the residential soil RBC is a conservative estimate assuming that a receptor is in contact with sediment at much lower exposure parameters (i.e., ingestion rate, skin surface area, exposure frequency, and exposure duration). RBCs that are based on noncarcinogenic effects were used as presented for residential soil in the most current RBC table (USEPA, 2002). RBCs based on carcinogenic effects were 10 times the current USEPA Region III RBCs for residential soil. Constituents having a maximum detected concentration less than the lowest applicable adjusted residential soil RBC were not retained as sediment COPCs for the HHRA. Lead concentrations in sediment were compared to the USEPA residential child soil screening value of 400 ppm, as determined using the IEUBK Model. If the lead concentration exceeded the screening value, it was evaluated quantitatively for the site worker using the adult lead model (refer to Appendix J).

5.2.2.5 Based on Comparison with Recommended Dietary Allowances (RDAs)

Constituents that are essential human nutrients (e.g., magnesium, calcium, potassium, and sodium) were not considered further in the quantitative risk assessment as they are typically present at low concentrations (i.e., at or near naturally occurring levels), and are toxic only at very high doses.

5.2.2.6 Additional Selection

Constituents may be considered for inclusion in the risk assessment, even if they have been eliminated through one of the methods above, based on historical information, exceptional toxicity, mobility, persistence, bioaccumulation, special treatability problems, or exceedance of Applicable or Relevant and Appropriate Requirements (ARARs). No additional constituents were included in this HHRA.

5.2.3 Chemicals of Potential Concern

Tables 5-3 and 5-4 identify the chemicals that were selected as COPCs based on the above screening methodology for soil, subsurface soil, surface water, and sediment for the *Lab Area Underground Sewer Area* and the *Lab Area Surface Soil and Wetland Area*, respectively. Details of the screening process are shown in the RAGS Part D Standard Table 2s (i.e., the screening tables) in Appendices H and I for the *Lab Area Underground Sewer Lines* and the *Lab Area Surface Soil and Wetland Area*, respectively.

5.3 Exposure Assessment

Exposure refers to the potential contact of an individual with a chemical. The exposure assessment identifies pathways and routes by which an individual may be exposed to the COPCs, and estimates the magnitude, frequency, and duration of potential exposure. The magnitude of exposure is determined by estimating the amount of a constituent available at the exchange boundaries (e.g., the lungs, gastrointestinal tract, and skin). Chemical intakes and associated health risks are only quantified for complete exposure pathways.

Contaminant fate and transport is evaluated in Section 4, which discusses the potential release mechanisms at the sites. A conceptual exposure model showing potential exposure scenarios identified under current and potential future conditions is presented in Figure 5-1. The following sections discuss the three components of exposure assessment:

- Characterization of exposure setting;
- Identification of exposure pathways; and
- Quantification of exposure.

5.3.1 Characterization of Exposure Setting

Characterizing an exposure setting consists of two parts: (1) presenting the physical characteristics of the site as they relate to exposure, and (2) characterizing human populations on or near the site.

5.3.1.1 Physical Characteristics

Basic site characteristics such as physical setting, climate, groundwater hydrology, and the presence and location of surface water were discussed and summarized in Sections 1 through 3.

5.3.1.2 Potentially Exposed Populations

Potentially exposed populations are identified based on their locations relative to the site, their activity patterns, and the presence of potential sensitive sub-populations. Past

activities at and near the Lab Area have resulted in detections of VOCs, SVOCs, explosives, and metals. Table 1 in Appendix H and Table 1 in Appendix I summarize the potentially exposed populations evaluated in this risk assessment for the *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area*, respectively.

5.3.1.3 Current Land Use

Lab Area Underground Sewer Lines

The *Lab Area Underground Sewer Lines* grouping lies within the Lab Area, an industrial area. The *Lab Area Underground Sewer Lines* includes multiple sites in the northwest, central west, central east and southwestern areas of the Lab Area, with no residential use in the vicinity of any of these areas. Workers may have contact with subsurface soil during excavation for repair of sewer lines and contact with sediment in the manholes during maintenance activities. Groundwater is not included in this risk assessment as previous investigations (and this RI) determined that no shallow water-bearing zone is present. Exposure routes may include incidental ingestion and dermal contact with subsurface soil and sediment, as well as inhalation of vapors or particulate matter from the subsurface soil.

Lab Area Surface Soil and Emergent Wetland Area

The pathways associated with direct and indirect contact with surface soil may be complete for adult industrial workers currently engaged in maintenance activities at the site. Potential trespassers/visitors could have contact with surface soil as well. Exposure routes may include incidental ingestion, dermal contact, and inhalation of vapors or particulate matter (dust) from the surface.

The emergent wetland area is in the southeast portion of the Lab Area. Surface water and sediment in the wetland area have been impacted by releases from within the laboratories.

The Lab Area and NDWIH are posted to restrict access and there is partial fencing around the base. The fence is not continuous along the exterior of the base, however, and there is no fencing around the Lab Area. Potential recreational users (i.e., adults and child) could have contact with impacted surface water and sediment. Exposure routes may include incidental ingestion and dermal contact.

5.3.1.4 Potential Future Uses

Lab Area Underground Sewer Lines

The potential future exposure scenario assumes that the subsurface soil will be excavated and become surface soil. Therefore, potential future exposure to the soil may be possible for residents, trespassers/visitors, industrial workers, and construction workers during excavation activities at the site. The potential future exposure to the soil (i.e., subsurface soil becoming surface soil) is assumed to include ingestion, dermal contact, and inhalation of vapors or particulate matter (dust) from the soil.

Storm drains and sanitary manholes are present in the vicinity of the laboratories. Sewer sediments have potentially been impacted by releases from within the laboratories. Direct contact with impacted sewer sediment is assumed to be possible for industrial workers. Exposure includes incidental ingestion and dermal contact. The exposure frequency for the

future industrial worker is assumed to be greater than that for the current worker, and therefore, the current and future worker receptor of sewer sediment are not the same.

Lab Area Surface Soil and Emergent Wetland Area

Possible future exposure scenarios related to surface soil may include residential, industrial worker, and trespasser/visitor. It is conservatively assumed that the impacted surface soil will be on the site during any future development. The potential future exposure to the surface soil is evaluated for adult and child residents, adult industrial workers, and adult and adolescent trespassers/visitors through ingestion and dermal contact.

Potentially, future adult construction workers may be exposed to surface soil during site development activities. Exposure routes considered under this scenario are ingestion, inhalation, and dermal contact.

The wetland area is assumed to remain the same in the future as it is under current conditions. Direct contact with impacted surface water and sediment is assumed for possible for recreational users (i.e., adult and child). Exposure routes are assumed to include incidental ingestion and dermal contact. No volatile COPCs were retained for emergent wetlands sediment.

5.3.2 Identification of Exposure Pathways

An exposure pathway can be described as a mechanism that moves a COPC from its source to an exposed population or individual, referred to as a receptor. An exposure pathway must be complete or exposure cannot occur. A complete exposure pathway has five elements:

1. A source (e.g., chemical residues in soil);
2. A mechanism for release and migration of chemical (e.g., leaching);
3. An environmental transport medium (e.g., groundwater);
4. A point or site of potential human contact, or exposure point (e.g., drinking water); and
5. A route of intake (e.g., ingestion of groundwater used as a drinking water source).

All five elements must be present for a pathway to be considered complete. If one or more elements are not present, then the pathway is incomplete and there is no possibility of exposure. The following subsections discuss the elements as they pertain to the site.

5.3.2.1 Contaminant Sources

In the *Lab Area Underground Sewer Lines*, mercury was disposed of down the drain lines of the laboratory buildings during mercury handling and disposal procedures (NEESA, 1992). In the *Lab Area Surface Soil and Wetlands Area*, spent mercury handling procedures at Building 103 and other buildings in the laboratory area often resulted in spills of mercury. In addition, mercury was inadvertently washed out of the containers down the drain system.

5.3.2.2 Release and Transport Mechanisms

The fate and transport of chemicals in surface soil, subsurface soil, surface water, and sediment are determined by physical characteristics of the site as well as by the chemical and physical properties of the constituents. A detailed description of the fate and transport analysis of the site contamination conditions is included in Section 4.

The primary transport mechanism from sources at the *Lab Area Underground Sewer Lines* appears to be by way of surface water and sediment in the sewer pipes and manholes (refer to Section 4.2.1). The primary transport mechanism from sources at the *Lab Area Surface Soil and Wetland Area* appears to be chemical leaching from surface soil to subsurface soil; surface runoff transport of contaminants, followed by downgradient transport in surface water and sediment; and/or wind erosion of contaminated surface soil (or volatilization of mercury in the surface soil) into the air, and subsequent deposition (refer to Section 4.2.1).

5.3.2.3 Potential Exposure Points and Exposure Routes

Exposure points are locations where humans could be exposed to contamination. On-site exposure points for the *Lab Area Underground Sewer Lines* include subsurface soil and sediment in the sewer pipes or manholes. Exposure points for the *Lab Area Surface Soil and Wetlands Area* consist of the surface of the site and the sediment and surface water in the emergent wetlands.

An off site exposure point exists at the discharge point from the Lab Area to Mattawoman Creek; however, this off site exposure is not considered in this HHRA since it is evaluated in the Mattawoman Creek Study by TTNUS.

Potential exposure routes are evaluated for current site use and potential future site use. Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Tables 5-5 and 5-6 for the *Lab Area Underground Sewer Lines* and the *Lab Area Surface Soil and Wetlands Area*, respectively.

5.3.2.4 Current Exposure Routes

The contaminated media currently accessible at the site are subsurface soil and sediment for the *Lab Area Underground Sewer Lines* and surface soil, surface water, and sediment for the *Lab Area Surface Soil and Wetlands Area*. Based on current site use, potential receptors include industrial workers, other workers (e.g., maintenance), adult and adolescent trespassers, and adult and child recreational users.

For the *Lab Area Underground Sewer Lines*, the current land use exposure routes include the following:

- Other Worker: incidental ingestion of, inhalation of, and dermal contact with subsurface soil; and incidental ingestion of and dermal contact with sediment.

For the *Lab Area Surface Soil and Emergent Wetland Area*, the current land use exposure routes include the following:

- Industrial Worker: incidental ingestion of, inhalation of, and dermal contact with surface soil.
- Adult/Adolescent Trespasser: incidental ingestion of, inhalation of, and dermal contact with surface soil.
- Other Recreational Person Adult/Child: incidental ingestion of and dermal contact with surface water and sediment.

5.3.2.5 Future Exposure Routes

Based on the proposed future use of the site, the future receptors could be industrial workers, construction workers, trespassers/visitors, recreational users, and residents. The potential future exposure scenario for the *Lab Area Underground Sewer Lines* assumes that the subsurface soil will be excavated and become surface soil. Additionally, the industrial worker may be exposed to the sediment during repair of sewer lines.

For the *Lab Area Underground Sewer Lines*, the future land use exposure routes include the current routes and the following additional routes:

- Industrial Worker: incidental ingestion of, inhalation of, and dermal contact with subsurface soil (assumed to be moved to the surface) and sediment.
- Adult/Adolescent Trespasser/Visitor: incidental ingestion of, and dermal contact with, subsurface soil (assumed to be moved to the surface).
- Construction Worker: incidental ingestion of, inhalation of, and dermal contact with subsurface soil.
- On-site Resident (adult and child): ingestion of, inhalation of, and dermal contact with subsurface soil (assumed to be moved to the surface).

For the *Lab Area Surface Soil and Emergent Wetland Area*, the future land use exposure routes include the current routes and the following additional routes:

- Construction Worker: incidental ingestion of, inhalation of, and dermal contact with surface soil.
- On-site Resident (adult and child): incidental ingestion of, inhalation of, and dermal contact with surface soil.

5.3.3 Exposure Parameters and Equations

The exposure pathways listed above were selected in consultation with USEPA Region III, MDE, and the Navy in October 2001, as well as according to the memorandum from Alvaro Alvarado of USEPA Region III to CH2M HILL (USEPA Region III, 2003). The exposure concentrations used to calculate potential risks to each of the receptors are presented in Tables 3.1 through 3.6 in Appendix H for the *Lab Area Underground Sewer Lines* and in Appendix I for the *Lab Area Surface Soil and Wetland Area*. The exposure parameters and equations used to calculate the risks are presented in Tables 4.1 through 4.14 in Appendix H for the *Lab Area Underground Sewer Lines*, and in Tables 4.1 through 4.18 in Appendix I for the *Lab Area Surface Soil and Wetland Area*.

5.3.4 Quantification of Exposure

Exposure is quantified by estimating the exposure point concentrations and chemical intake by the receptor. Exposure scenarios were evaluated as Reasonable Maximum Exposure (RME), which is a conservative representation of potential exposure. In cases where the hazard index or risks exceeded the USEPA thresholds, a Central Tendency (CT) evaluation was performed using assumptions that are less conservative the RME scenario, or more likely to reflect actual expected exposures.

5.3.4.1 Exposure Point Concentrations

Exposure point concentrations are estimated chemical concentrations that a receptor may contact and are specific to each exposure medium. Exposure point concentrations may be directly monitored or estimated using environmental fate and transport models.

The exposure point concentration for the RME scenario is based on the 95 percent UCL for a medium in which five or more samples were collected. The maximum detected concentration was used in place of the 95 percent UCL when the calculated 95 percent UCL was greater than the maximum detected value. The Shapiro-Wilks W-test, using an alpha value of 1 percent, was used to determine if the data fit a log-normal or normal distribution. If the W-test was inconclusive, the 95 percent UCL that best fit the data, as indicated by the higher W-test value, was used. For data sets with fewer than five samples, the maximum detected concentration was used as the exposure point concentration. For the exposure point concentration for the central tendency evaluation, the arithmetic mean-value was used.

The 95 percent UCL for a log-normal distribution was calculated as follows:

$$95 \text{ percent UCL} = \exp(TM + 0.5 \times s^2 + (s \times H/(n-1)^{0.5}))$$

where: exp = natural log
TM = transformed mean
s= standard deviation of the transformed data
H= H-statistic
n= sample size

The 95 percent UCL for a normal distribution was calculated as follows:

$$95\text{-percent UCL} = NM+(t \times s/(n)^{0.5})$$

where: NM= normal arithmetic mean
t= t-statistic
s= standard deviation
n= sample size

Data validation flags were considered (as discussed in Section 3.2.1) when estimating the 95 percent UCL. The 95 percent UCL concentrations are included in the RAGS Part D standard Table 3s (i.e., Tables 3.1 through 3.6 in Appendices H and I for the *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area*, respectively).

5.3.4.2 Estimation of Chemical Intakes for Individual Pathways

Chemical intake is the amount of the chemical contaminant entering the receptor's body. Chemical intakes are generally expressed as follows:

$$I\left(mg/kg/day\right)=\frac{C\ x\ CR\ x\ EF\ x\ ED}{BW\ x\ AT}$$

where: I = intake (mg/kg-day)
C = chemical concentration at exposure point (mg/l, mg/kg, mg/m^3)
CR= contact rate, or amount of contaminated medium contacted per unit time or event (l/day, mg/event, m^3/day)
EF= exposure frequency (days/year)
ED= exposure duration (years)
BW= body weight of exposed individual (kg)
AT= averaging time, or period over which exposure is averaged (days)

The intake equation requires specific exposure parameters for each exposure pathway. Exposure parameters are often assumed values, and their magnitude influences the estimates of potential exposure (and risk). The reliability of the values chosen can also contribute substantially to the uncertainty of the resulting risk estimates. Many of the exposure parameters have default values, which were used for this assessment. These assumptions (based on estimates of body weights, media intake levels, and exposure frequencies/duration) are provided by USEPA guidance. Other assumptions (e.g., exposure duration for the construction worker soil exposure scenario) required consideration of location-specific information and were determined using professional judgment. Exposure factors used for different scenarios at the site are presented in Tables 4.1 through 4.14 in Appendix H for the *Lab Area Underground Sewer Lines* and Tables 4.1 through 4.18 in Appendix I for the *Lab Area Surface Soil and Wetland Area*. Both RME and CT intakes were included in this evaluation. CT intakes were calculated for exposure scenarios with RME cancer risks greater than $1x10^{-5}$ or noncancer hazards greater than 1.

For residential exposure to soil, lifetime age-adjusted intakes were calculated for carcinogenic constituents. This involved determining age-adjusted factors for ingestion and dermal contact. These factors were calculated using the equations presented in the USEPA Region III RBC Table (USEPA, October 2002) for calculating age-adjusted factors.

For the dermal contact with soil scenario, an absorption factor is required. The default absorption factors used for this evaluation were 10 percent for SVOCs, 3.2 percent for arsenic, and 1 percent for other metals (USEPA, December 1995). For the dermal contact with water scenario, skin permeability rates were obtained from the USEPA's *Dermal Exposure Assessment Guidance* (USEPA, January 1992).

5.4 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: (1) hazard identification and (2) dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the chemical, along with the type of health effect involved. Dose-response assessment 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. Toxicity criteria (e.g., reference doses and slope factors) are derived from the dose-response relationship. USEPA has performed the toxicity assessment step for many chemicals and has published the results in the Integrated Risk Information System (IRIS; USEPA, 2002) and Health Effects Assessment Summary Tables (HEAST; USEPA, 1997) databases.

Health effects are divided into two broad groups: (1) noncarcinogenic effects and (2) carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing noncarcinogenic health effects are evaluated independently from those having carcinogenic effects. Some chemicals may produce both noncarcinogenic and carcinogenic effects, and, therefore, are evaluated in both groups. This section discusses noncarcinogenic and carcinogenic effects, separately, and concludes with a brief discussion of the toxicological properties of selected COPCs.

The primary source of toxicity values is the USEPA's IRIS database, which contains up-to-date health risk and USEPA regulatory information. IRIS includes only reference doses (RfDs) and cancer slope factors (CSFs) that have been verified by USEPA work-groups. The IRIS database is the USEPA's preferred source of toxicity information. The HEAST databases, which are issued by USEPA's Office of Research and Development, were consulted when data were not available in IRIS. If data were not available from either of these sources, National Center for Environmental Assessment (NCEA) data were used. If no toxicity values were available, the chemical was evaluated qualitatively.

5.4.1 Toxicity Information for Noncarcinogenic Effects

Noncarcinogenic health effects include a variety of toxic effects on body systems, ranging from renal toxicity (toxicity to the kidneys) to central nervous system (CNS) disorders. Noncarcinogenic health effects are grouped into two basic categories: (1) acute toxicity and (2) chronic toxicity. Acute toxicity can occur after a single exposure (usually at high doses), and the effect is most often seen immediately. Chronic toxicity generally occurs after repeated exposure (usually at low doses), and the effect is seen weeks, months, or years after the initial exposure. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (December 1989) defines the chronic RfD as a dose that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (i.e., 7 years to a lifetime), and consider uncertainty in the toxicological database and sensitive receptors. Chronic RfDs may be overly protective if used to evaluate the potential for adverse health effects resulting from short-term exposure. USEPA's NCEA develops sub-chronic RfDs for short-term exposure (i.e., 2 weeks to 7 years). Sub-chronic RfDs have been peer-reviewed by Agency and outside reviewers, but they have not undergone verification by an intra-Agency workgroup, and as a result are considered interim rather than verified toxicity values. Chronic and sub-chronic RfDs are developed for both the inhalation and oral exposures. Sub-chronic RfDs were used for the construction worker scenario because the exposure duration is 1 year.

In the development of RfDs, all available studies examining the toxicity of a chemical following exposure are considered based on their scientific merit. The lowest dose level that an observed toxic effect is occurring is identified as the "lowest-observed-adverse-effect-level" (LOAEL). The dose that no effect is observed is identified as the "no-observed-adverse-effect-level" (NOAEL). Several uncertainty factors (UFs) may be applied to account for uncertainty. UFs account for such uncertainties as poor data quality, extrapolation of data from animal studies to human exposures, or the use of sub-chronic studies to develop chronic criteria. These UFs range from 10 to 10,000, and are based on professional judgment. Therefore, there are varying degrees of uncertainty in the toxicity criteria.

Available USEPA-derived oral ingestion RfDs [and associated UF and modifying factor (MF) values] for the COPCs at the *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area* are listed in Tables 5-1 and 5-2 in both Appendices H and I, respectively.

Per USEPA guidance, oral RfDs were adjusted from administered doses to absorbed doses for evaluating dermal toxicity. The RfDs were adjusted using oral absorption factors from USEPA (April 1999) and comments provided by USEPA (April 12, 2000). The adjusted dermal RfDs are summarized in Table 5-1 in Appendix H for the *Lab Area Underground Sewer Lines* and in Appendix I for the *Lab Area Surface Soil and Wetland Area*.

5.4.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects are quantified as oral cancer slope factors. Slope factors are expressed in units of per milligram per kilogram of body weight per day, or $(mg/kg\text{-}day)^{-1}$, and unit risk factors are expressed in units of per micrograms per cubic meter, or $(\mu g/m^3)^{-1}$.

CSFs may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than are likely to be encountered in the environment. This design detects possible adverse effects in the relatively small test populations used in the studies. A number of mathematical models and procedures have been developed to extrapolate from the high doses used in the studies to the low doses typically associated with environmental exposures.

The USEPA-preferred linearized multi-stage (LMS) model is usually used to estimate the largest linear slope (within the upper 95 percent UCL) at low extrapolated doses that is consistent with the data. The 95 percent UCL slope of the dose-response curve is subjected to various adjustments, and an inter-species scaling factor is usually applied to derive a CSF or inhalation unit risk factor for humans. It is assumed that if a cancer response occurs at the dose level in the study, there is some probability that a response will occur at all lower exposure levels (i.e., a dose-response relationship with no threshold is assumed). Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves on an ad hoc basis. In both types of analyses, conservative (e.g., health protective) assumptions are applied, and the models are believed to provide rough estimates of the upper limits on potential lifetime risk.

Exposure is averaged over the average adult lifetime of 70 years. The actual risks from exposure to a potential carcinogen are not likely to exceed the estimated risks, and are probably much lower (or even zero). USEPA-derived oral CSFs are listed in Tables 6-1 and 6-2 in both Appendices H and I for the *Lab Area Underground Sewer Lines* and *Lab Area*

Surface Soil and Wetland Area, respectively. The adjusted dermal CSFs are summarized in Table 6-1 in both Appendices H and I for the *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area*, respectively.

In addition to deriving a quantitative estimate of cancer potency, USEPA also assigns weight-of-evidence classifications to potential carcinogens. Chemicals are classified as Group A, Group B1, Group B2, Group C, Group D, or Group E carcinogens:

- **Group A** chemicals (i.e., known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.
- **Group B1** chemicals (i.e., probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans with sufficient evidence of carcinogenicity in laboratory animals.
- **Group B2** chemicals (i.e., probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate evidence in humans.
- **Group C** chemicals (i.e., possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.
- **Group D** chemicals (i.e., not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.
- **Group E** chemicals (i.e., evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

These classifications of the COPCs are included in Tables 6-1 and 6-2 in both Appendices H and I for the *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area*, respectively.

5.4.3 Chemicals for Which no USEPA Toxicity Values are Available

Most of the chemicals detected at the site have toxicity factors. If not, appropriate constituents were chosen as surrogates for the COPC selection, and then the constituent was not retained as a COPC. In this assessment, lead is the only COPC that did not have available published toxicity factors. Lead is regulated by USEPA based on blood-lead uptake using a physiologically-based pharmakokinetic model referred to as the IEUBK model (in the event of excess lead present at the site). As a screening tool, lead is screened at 400 mg/kg in soil and sediment and 15 µg/l in surface water (OSWER Directive, December 1996). The maximum detected concentration of lead in the surface soil for the *Lab Area Surface Soil and Wetland Area* was 31,200 mg/kg (in sample IS53SS26), in the subsurface soil for the *Lab Area Underground Sewer Lines* was 443 mg/kg (in sample IS53SB10), and in the sewer sediment for the *Lab Area Underground Sewer Lines* was 1,510 mg/kg (in sample IS53SD04), all exceeding the screening values.

The average lead concentrations in the media where the maximum exceeds the screening level are used as the lead exposure point concentrations, following USEPA guidance. The average concentration of lead in the *Lab Area Surface Soil and Wetland Area* surface soil was

161 mg/kg, based on a log-normal distribution. Based on a comment from Alvaro Alvarado of USEPA Region III (USEPA Region III, 2003), the exposure point concentration for lead in the surface soil for the *Lab Area Surface Soil and Wetland Area* was recalculated using results of samples located around Buildings 102, 103, and 304 (an area with a grouping of high lead concentrations at the site). The sample set included samples IS53SS1 through IS53SS4, IS53SS24 through IS53SS34, IS53SS42, and IS53SS74 through IS53SS76. The resulting exposure point concentration was 2,902 mg/kg, based on a log-normal distribution of the specific sample set. The average concentration of lead in the *Lab Area Underground Sewer Lines* subsurface soil was 14.3 mg/kg, based on a log-normal distribution. The average concentration of lead in the *Lab Area Underground Sewer Lines* sediment was 167 mg/kg, based on a log-normal distribution. Risks associated with lead in the surface and subsurface soils were evaluated for the resident, and risks associated with lead in the surface soil, subsurface soil, and sediment were evaluated for an adult worker.

Risks associated with non-residential adult exposure to lead were evaluated based on *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil,* USEPA, December 1996. This approach utilizes a methodology to relate soil lead intake to blood lead concentrations in women of child-bearing age. The methodology focuses on estimating fetal blood lead concentration in women exposed to lead contaminated soils. This guidance provides a set of default parameter values that can be used in cases where high quality data are not available to support site-specific estimates. Risks associated with residential exposure to lead were evaluated using USEPA's IEUBK Model. The principal assumption associated with the use of IEUBK is that a child from ages 0 to 7 years old is the receptor for potential exposure to lead in soil.

The results of the IEUBK model are shown in Appendix J. The IEUBK evaluation for surface soil resulted in a geometric mean blood concentration of 3.1 micrograms per deciliter (µg/dl) for children 0 to 84 months old (refer to Table J-1 in Appendix J). Approximately 99 percent of this population had a blood lead level below USEPA's recommended level of 10 µg/dl. The IEUBK evaluation for surface soil using the lead samples collected near Buildings 102, 103, and 304 resulted in a geometric mean blood concentration of 19.3 µg/dl for children 0 to 84 months old (refer to Table J-2 in Appendix J). Approximately 92 percent of this population had a blood lead level above USEPA's recommended level of 10 µg/dl. The IEUBK evaluation for the subsurface soil resulted in a geometric mean blood lead concentration of 1.7 µg/dl for children 0 to 84 months old (refer to Table J-3 in Appendix J), with over 99.9 percent of this population with a blood lead level below USEPA's recommended level of 10 µg/dl. USEPA considers lead in soil not to be a health concern if 90 percent of the population has a blood-lead level less than 10 µg/dL. With the exception of the lead soil concentration (input as either the site-wide average in Tables J-1 and J-3, or the average from soil samples collected around Buildings 102, 103, and 304 in Table J-2), the default parameters associated with the IEUBK model were used in this evaluation (as shown in Appendix J).

The results of the site-wide adult lead model are presented in Table J-4 (in Appendix J) for the industrial worker. As shown in Table J-4, the calculated acceptable lead soil concentration for an adult industrial worker was 1,113 mg/kg. This was above the site average concentrations for surface soil (i.e., 161 mg/kg), subsurface soil (i.e., 14.3 mg/kg), and sewer

sediment (i.e., 167 mg/kg). The average concentration of lead in the surface soil samples collected around Buildings 102, 103, and 304 was 2,902 mg/kg, above the acceptable lead concentration calculated using the adult lead model (refer to Table J-5 in Appendix J). Therefore, there may be a risk to female adult workers (and their unborn fetuses) if exposed to the lead in the surface soil in this specific area around Buildings 102, 103, and 304 (due to incidental ingestion or inhalation of the surface soil in this specific area).

Although the results of the IEUBK model indicate a potential health concern for small children exposed to the surface soil near Buildings 102, 103, and 304, the area is not accessible to the public and there are no future plans for a residential exposure. Therefore, lead in the surface and subsurface soil is not considered to pose a significant health risk under industrial use of the Lab Area, as a whole; however, if future residential development occurs in the specific area surrounding Buildings 102, 103, and 304, there could be a concern for young children.

5.5 Risk Characterization

Risk characterization is the process of integrating the previous elements of the risk assessment into quantitative and semi-quantitative expressions of risk. The quantification of risk is then used as an integral component in remedial decision-making and selection of potential remedies or actions.

5.5.1 Noncarcinogenic and Carcinogenic Risk Estimation Methods

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. The noncarcinogenic health impacts from carcinogens are also assessed.

5.5.1.1 Noncarcinogenic Risk Estimation

Noncarcinogenic health risks are estimated by comparing actual or expected exposure levels to threshold concentrations (or RfDs). The expected intake, divided by the RfD, is equal to the hazard quotient (HQ):

$$HQ = Intake / RfD$$

The intake and RfD are expressed in the same units and represent the same exposure period (i.e., chronic or sub-chronic). The intake and RfD also represent the same exposure route (i.e., inhalation intakes are divided by the inhalation RfD, oral intakes are divided by the oral RfD, and dermal intakes are divided by an adjusted oral RfD). When HQ exceeds unity (i.e., exposure exceeds the RfD), a certain degree of health risk is indicated.

To assess the potential for noncarcinogenic health effects posed by exposure to multiple chemicals, a “hazard index” approach is used (USEPA, December 1989). This approach assumes that noncarcinogenic hazards associated with exposure to more than one chemical are additive. Synergistic or antagonistic interactions between chemicals are not accounted for. The hazard index (HI) may exceed unity even if all of the individual HQs are less than one. The chemicals may then be segregated by similar mechanisms of toxicity and toxicological effects, and separate HIs derived based on mechanism and target organs affected.

5.5.1.2 Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating excess lifetime cancer risk. Excess lifetime carcinogenic risk is the incremental increase in the probability of developing cancer during one's lifetime (in addition to the background probability of developing cancer). For example, the background incidence of cancer in the U.S. population is approximately 30 percent, including both lethal and non-lethal forms. Therefore, a $2x10^{-6}$ excess lifetime carcinogenic risk means that an individual's probability of developing cancer in his or her lifetime changes from approximately 0.300000 to 0.300002. Or, expressed another way, for every 1 million people exposed to the carcinogen throughout their lifetime, the incidence of cancer *may* increase by two cases.

Potential carcinogenic risks associated with exposure to individual carcinogens were calculated using the CSFs from IRIS and HEAST (presented in the Toxicity Assessment section) and the intakes calculated in the Exposure Assessment section. Risk is calculated by multiplying the intake by the CSF:

$$\text{Risk} = \text{Intake} \times \text{CSF}$$

The combined risk from exposure to multiple chemicals at a site was evaluated by adding the risks from individual chemicals. Risks were also added across the pathways, if an individual would be exposed through multiple pathways. For example, a person contacting the soil on-site could be exposed by both the oral and dermal pathways.

When a cumulative carcinogenic risk to an individual receptor under the assumed RME exposure conditions at the site exceeds 100 in a million (i.e., 10^{-4} excess cancer risk), CERCLA generally requires remedial action to reduce risks at the site (USEPA, March 1991). If the cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted for a risk-based chemical-specific standard [e.g., for a maximum contaminant level (MCL) exceedance]. A risk-based remedial decision could be superseded by the presence of noncarcinogenic impact or environmental impact requiring action at the site.

5.5.2 Risk Assessment Results

The results of the risk characterization are presented below. Total risks are summarized by receptor following the media specific discussions. A summary of the results by media is shown in Tables 5-7, 5-8, 5-9, and 5-10 for the RMEs, and Tables 5-13, 5-14, 5-15, and 5-16 for the CTs. The CT-values were calculated only when the RME hazards exceeded 1 or the cancer risks exceeded 10^{-5}.

5.5.2.1 Soil Exposure

Risks were calculated for exposure to surface soil and subsurface soil.

Subsurface Soil Exposure - Lab Area Underground Sewer Lines

At the *Lab Area Underground Sewer Lines*, RME risks estimates for exposure to subsurface soil were calculated for an adult other worker (e.g., maintenance workers) under current site use, as well as for an adult construction worker, industrial worker, trespasser/visitor, and resident under future site use (refer to Appendix H, Tables 7.1.RME, 7.2.RME, 7.5.RME through 7.14.RME; and Tables 8.1.RME, 8.2.RME, and 8.5.RME through 8.14.RME). The

subsurface soil risks are summarized in Table 5-7. Exposure to subsurface soil via incidental ingestion, inhalation, and dermal contact were evaluated.

The noncarcinogenic hazard associated with exposure to subsurface soil by other workers (i.e., 0.1) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to subsurface soil by other workers (i.e., $1x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to subsurface soil by construction workers (i.e., 2.3) exceeded USEPA's benchmark of 1.0. The main contributor to the noncancer HI for the construction worker was mercury with a HI of 1.5. The carcinogenic risk associated with exposure to subsurface soil by a construction worker (i.e., $2x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to subsurface soil by industrial workers (i.e., 0.6) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to subsurface soil by an industrial worker (i.e., $1x10^{-5}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

For the adult resident, the noncarcinogenic hazard associated with exposure to subsurface soil through the ingestion, inhalation, and dermal routes (i.e., 1.6) was above USEPA's target hazard index of 1.0. The main contributor to the noncancer HI for the adult resident was mercury through the inhalation pathway.

For the child resident, the RME noncarcinogenic hazard associated with exposure to the subsurface soil (i.e., 7.0) was above USEPA's benchmark noncarcinogenic HI of 1.0. Inhalation and ingestion of mercury, as well as ingestion of iron, provided the majority of the noncarcinogenic hazard.

The carcinogenic risk for subsurface soil for the resident is presented as a lifetime, or age-adjusted, risk. The RME carcinogenic risks associated with exposure to subsurface soil by a lifetime or age-adjusted resident (i.e., $4x10^{-5}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Lead was selected as a COPC for the subsurface soil because the maximum detected concentration exceeded the soil screening level of 400 mg/kg. Therefore, the adult lead model and the IEUBK model were used to evaluate the potential impacts on the receptors. The results of these models indicated exposure to lead in soil by residents or industrial workers was not a potential concern (refer to Section 5.4.3).

Because the RME noncarcinogenic HI for the construction worker and resident, and the carcinogenic risk for the industrial worker exceeded an HI of 1 and/or carcinogenic risk of 1 x 10^{-5}, CT exposure risks were calculated. The CT hazards and carcinogenic risks were all within USEPA's recommended levels for the construction worker, industrial worker, and resident (refer to Table 5-13).

Surface Soil Exposure—Lab Area Surface Soil and Emergent Wetland Area

At the *Lab Area Surface Soil and Wetland Area*, RME risk estimates for exposure to surface soil were calculated for the current/future industrial worker and trespasser/visitor, as well as for the construction worker and resident under future conditions (refer to Appendix I,

Tables 7.1.RME through 7.6.RME and 7.11.RME through 7.16.RME; and 8.1.RME through 8.6.RME, 8.11.RME through 8.14.RME). The calculated surface soil RME risks are summarized in Table 5-8. It was assumed these receptors would be exposed to soil through incidental ingestion, inhalation, and dermal contact.

The noncarcinogenic hazard associated with exposure to surface soil for an industrial worker (i.e., 2.3) was above USEPA's target hazard index of 1.0. The main contributor to the noncancer HI was mercury. The carcinogenic risk associated with exposure to the soil by an industrial worker (i.e., $1x10^{-5}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil by an adult trespasser/ visitor (i.e., 0.3) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface soil by adult trespassers/visitors (i.e., $2x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil by an adolescent trespasser/visitor (i.e., 0.2) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to surface soil by adolescent trespassers/visitors (i.e., $2x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface soil for a construction worker (i.e., 7.7) was above USEPA's target hazard index of 1.0. The main contributor to the noncarcinogenic HI was mercury, with an ingestion HI of 3.5 and an inhalation HI of 3.4. The carcinogenic risk associated with exposure to the soil by a construction worker (i.e., $2x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

For the adult resident, the noncarcinogenic hazard associated with the ingestion and dermal exposure with the surface soil (i.e., 6.3) was above USEPA's target hazard index of 1.0. The main contributor to the noncancer HI was mercury with an inhalation route HI of 4.7 and an ingestion route HI of 1.0.

For the child resident, the RME noncarcinogenic hazard associated with exposure to surface soil (25) is above USEPA's benchmark noncarcinogenic hazard index of 1.0. The main contributor to the noncancer HI was ingestion and inhalation of mercury.

The carcinogenic risk for surface soil for the resident is presented as a lifetime or age-adjusted risk. The RME carcinogenic risks associated with exposure to surface soil by a lifetime or age-adjusted resident (i.e., $4.8x10^{-5}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Lead was selected as a COPC for the surface soil because the maximum detected concentration exceeded the soil screening level of 400 mg/kg. Therefore, the adult lead model and the IEUBK model were used to evaluate the potential impacts of lead in surface soil on the receptors (refer to Section 5.4.3). Using the average lead concentration across the site, the lead models indicate exposure to lead in soil by residents or industrial workers was not a potential concern; however, as requested by USEPA (USEPA Region III, 2003), the average lead concentration in the specific area around Buildings 102, 103, and 304 was also input to the model. When this lead concentration was used, the model indicated a potential risk to residents and industrial workers exposed to lead in surface soil from this specific area.

Because the RME noncarcinogenic and/or carcinogenic risks for the industrial worker, construction worker, and resident exceeded the USEPA target levels, CT exposure risks were calculated. The CT hazards and carcinogenic risks were all within USEPA's recommended levels for the industrial worker, construction worker, and resident (refer to Table 5-14).

5.5.2.2 Water Exposure

Surface Water Exposure—Lab Area Surface Soil and Wetland Area

At the *Lab Area Surface Soil and Wetland Area*, RME risk estimates for exposure to surface water were calculated for other recreational users under current/future site use (refer to Appendix I, Tables 7.9.RME, 7.10.RME, 8.9.RME, and 8.10.RME). The calculated surface water RME risks are summarized in Table 5-8. It was assumed these receptors would be exposed to surface water through incidental ingestion and dermal contact.

The noncarcinogenic hazard associated with exposure to surface water by an adult other recreational person (i.e., 0.3) was below USEPA's target hazard index of 1.0. The carcinogenic risks associated with exposure to surface water by an adult other recreational person (i.e., $8x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to surface water by a child other recreational person (i.e., 0.6) was below USEPA's target hazard index of 1.0. The carcinogenic risks associated with exposure to surface water by a child other recreational person (i.e., $1x10^{-5}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

5.5.2.3 Sediment Exposure

Sewer Sediment Exposure—Lab Area Underground Sewer Lines

RME risks estimates for exposure to sediment were calculated for an adult other worker (i.e., maintenance workers) under current/future site use and an adult industrial worker for potential future site use (refer to Appendix H, Tables 7.3.RME, 7.4.RME, 8.3.RME, and 8.4.RME). The sediment risks are summarized in Table 5-7. Exposure to sediment via incidental ingestion and dermal contact was evaluated.

The noncarcinogenic hazard associated with exposure to sediment by other workers (i.e., 0.7) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by an other worker (i.e., $1.6x10^{-6}$) was within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

The noncarcinogenic hazard associated with exposure to sediment by an industrial worker (i.e., 0.3) was below USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by an industrial worker (i.e., $7.9x10^{-7}$) was below USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Sediment Exposure—Lab Area Surface Soil and Wetland Area

RME risks estimates for exposure to sediment were calculated for other recreational persons under current/future site use (refer to Appendix I, Tables 7.7.RME, 7.8.RME, 8.7.RME, and 8.8.RME). The sediment risks are summarized in Table 5-8. Exposure to sediment via incidental ingestion and dermal contact was evaluated.

The noncarcinogenic hazard associated with exposure to sediment by an adult other recreational person (i.e., 9) was above USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by an adult other recreational person (i.e., $1.3x10^{-4}$) was equal to the upper limit of USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. The main contributor to the noncancer HQ and carcinogenic risk was arsenic.

The noncarcinogenic hazard associated with exposure to sediment by a child other recreational person (i.e., 12.6) was above USEPA's target hazard index of 1.0. The carcinogenic risk associated with exposure to sediment by a child other recreational person (i.e., $4.9x10^{-5}$) was within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. The main contributor to the noncancer HQ was arsenic.

Because the RME noncarcinogenic and/or carcinogenic risks for the adult and child other recreational persons exceeds the HI of 1 and carcinogenic risk of $1x10^{-5}$, CT exposure risks were calculated. The CT hazards and carcinogenic risks were all within USEPA's recommended levels for the industrial worker, construction worker, and resident.

5.5.2.4 Summary of Total Risks across Pathways and Media

Tables 9.1.RME through 9.9.RME in both Appendix H (for the *Lab Area Underground Sewer Lines*) and Appendix I (for the *Lab Area Surface Soil and Wetland Area*) summarize the RME total potential risks to each receptor. Tables 9.10.CT through 9.13.CT in Appendix H summarize the CT total potential risks (to each receptor) that had risks exceeding an HI of 1.0 or a carcinogenic risk of $1x10^{-5}$ at the *Lab Area Underground Sewer Lines*. Similarly, Tables 9.10.CT through 9.16.CT in Appendix I summarize the CT total potential risks (to each receptor) that had risks that exceeding an HI of 1.0 or a carcinogenic risk of $1x10^{-5}$ at the *Lab Area Surface Soil and Wetland Area*. Total potential risks were summarized for each potential receptor.

Current/Future Other Worker

The risk assessment assumed that a current/future other (industrial) worker could be exposed to subsurface soil and sediment at *Lab Area Underground Sewer Lines*. The total RME noncarcinogenic hazard to an adult other worker exposed to subsurface soil and sediment were below USEPA's target noncarcinogenic HI (refer to Table 5-11 and Appendix H, Tables 9.1.RME and 9.2.RME). The carcinogenic risk to an adult other worker exposed to subsurface soil and sediment was within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.

Current/Future Industrial Worker

The risk assessment assumed that a current/future industrial worker could be exposed to surface soil in the *Lab Area Surface Soil and Wetland Area*. The total RME noncarcinogenic hazard to an adult industrial worker exposed to surface soil in the *Lab Area Surface Soil and Wetland Area* slightly exceeded USEPA's target noncarcinogenic HI (refer to Table 5-12 and Appendix I, Table 9.1.RME). The main contributor to the noncancer HI for the industrial worker was mercury through the inhalation and ingestion pathways. The CT noncarcinogenic HI was below USEPA's target noncarcinogenic HI (refer to Table 5-16 and Appendix I, Table 9.10.CT). The carcinogenic risk to an adult industrial worker exposed to

surface soil in the *Lab Area Surface Soil and Wetland Area* was within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.

Future Industrial Worker

The risk assessment assumed that a future industrial worker could be exposed to subsurface soil and sediment and the *Lab Area Underground Sewer Lines*. The total RME noncarcinogenic hazard to an adult industrial worker exposed to subsurface soil and sediment in the *Lab Area Underground Sewer Lines* was below USEPA's target noncarcinogenic hazard level (refer to Table 5-11 and Appendix H, Table 9.3.RME). The carcinogenic risk to an adult industrial worker exposed to subsurface soil and sediment in the *Lab Area Underground Sewer Lines* was within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.

Current/Future Trespasser/Visitor

The risk assessment assumed that a current/future trespasser/visitor might be exposed to surface soil at *Lab Area Surface Soil and Wetland Area*. The total RME noncarcinogenic hazards to both adult and adolescent trespassers/visitors exposed to surface soil did not exceed USEPA's target noncarcinogenic hazard level (refer to Tables 9.2.RME and 9.3.RME in Appendix I). The total RME carcinogenic risks to both adult and adolescent trespassers exposed to the surface soil were within USEPA's target risk range.

Future Resident

It was assumed that a future child and adult resident living on-site might be exposed to the subsurface soil (associated with the Lab Area *Underground Sewer Lines*) and the surface soil (associated with the *Lab Area Surface Soil and Wetland Area*). Exposure to subsurface soil in the *Lab Area Underground Sewer Lines* would result in a hazard above USEPA's target level for an adult resident and child (refer to Table 5-11 and Appendix H, Tables 9.7.RME and 9.8.RME). Inhalation and ingestion of mercury provided the majority of the noncarcinogenic hazard; however, the CT HI for the adult and child would be below USEPA's target HI (refer to Table 5-17 and Appendix H, Table 9.12.CT)

Based on RME exposure assumptions, exposure to subsurface soil in the *Lab Area Underground Sewer Lines* by a lifetime resident would result in a carcinogenic risk within USEPA's target risk range (refer to Table 5-11 and Appendix H, Table 9.9.RME).

Exposure to surface soil at the *Lab Area Surface Soil and Wetland Area* would result in a hazard greater than USEPA's target level for a child and adult resident (refer to Table 5-12 and Appendix I, Tables 9.7.RME and 9.8.RME). The hazard to the resident was mainly associated with mercury; however, the CT HI for the child and adult residents would be below USEPA's target HI (refer to Table 5-18 and Appendix I, Tables 9.14.CT and 9.15.CT).

Based on RME exposure assumptions, exposure to surface soil by a lifetime resident would result in a carcinogenic risk within USEPA's target risk range (refer to Table 5-12 and Appendix I, Table 9.9.RME).

Current /Future Other Recreational Person

The risk assessment assumed that a current/future other recreational person could be exposed to site surface water and sediment in the *Lab Area Surface Soil and Wetland Area*. Exposure to surface water and sediment through incidental ingestion and dermal contact

was evaluated. The total current/future RME noncarcinogenic hazards to both adult and child other recreational persons exposed to surface water and sediment exceeded USEPA's target noncarcinogenic hazard level (refer to Table 5-12 and Appendix I, Tables 9.4.RME and 9.5.RME). This noncarcinogenic hazard was due to dermal contact with arsenic in the sediment. The CT noncarcinogenic hazard to both the adult and child other recreational persons were below USEPA's target HI (refer to Table 5-18 and Appendix I, Tables 9.11.CT and 9.12.CT). The total current/future RME carcinogenic risk to the adult other recreational persons exposed to the surface water and sediment was equal to the upper limit of USEPA's target risk range. The RME carcinogenic risk to the child was within USEPA's target risk range. The CT carcinogenic risks to both the adult and child were within USEPA's target risk range.

Future Construction Worker

The risk assessment assumed that a future construction worker could be exposed to subsurface soil associated with the *Lab Area Underground Sewer Lines* and surface soil associated with the *Lab Area Surface Soil and Wetland Area*. The total future RME noncarcinogenic hazard to an adult construction worker exposed to subsurface and surface soil was above USEPA's target noncarcinogenic hazard level (refer to Tables 5-11 and 5-12 and Appendices H and I, Tables 9.4.RME and 9.6.RME). Mercury contributed the greatest amount to the HI; however, the CT HIs for both the surface soil and subsurface soil were below USEPA's target HI (refer to Tables 5-17 and 5-18). The carcinogenic risk to an adult industrial worker exposed to subsurface soil and surface soil in the *Lab Area Underground Sewer Lines* and the *Lab Area Surface Soil and Wetland Area* was within the USEPA's target carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$.

5.6 Uncertainty Associated with Human Health Risk Assessment

The risk measures used in site risk assessments are not fully probabilistic estimates of risk. Instead, they are conditional estimates, given that a set of assumptions about exposure and toxicity are realized. Thus, it is important to specify fully the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective.

A qualitative / semi-quantitative analysis of each of the risk assessment components is sufficient for most of the sites. A site-specific discussion on these individual components is presented in the following sections.

5.6.1 General Uncertainty in COPC Selection

The uncertainty in sampling and possibility of missing a contaminated location is expected to be minimal at this site because of the amount of sampling data available for the site. The quantitative uncertainty associated with the other factors is also minimal, as the data have been fully validated prior to use in the risk assessment. The general assumptions used in the COPCs selection are conservative to ensure the estimation of highest possible risk.

5.6.2 Uncertainty Associated with Exposure Assessment

Most of the exposure pathways analyzed are assumed, and exposure factors used for quantitation of exposure are conservative and reflect worst-case or upper bound assumptions on the exposure. Exposure to the surface soil, subsurface soil, surface water, and sediment is assumed to occur at the areas with the highest detected concentrations; however, the area with high contamination is much smaller than a receptor's area of operations during work hours or activity duration.

The future surface soil exposure scenario adds additional conservatism by assuming that the subsurface soil will become surface soil during any future construction activities. During many construction projects, clean fill material is placed over the soil that is disturbed during excavation projects. The clean fill material is generally needed to support growth of grass and other landscape plants.

The percent of a chemical absorbed through the skin is likely to be affected by many parameters. Some of the parameters include soil loading, soil moisture content, organic content, pH, and presence of other constituents. The availability of a chemical depends on site-specific fate and transport properties of the chemical species available for eventual absorption of skin. Chemical concentrations, specific properties of the chemical, and soil release kinetics all impact the amount of a chemical that is absorbed. These factors contribute to the uncertainty associated with these estimates and make quantitation of the amount of certain chemicals absorbed from soil difficult.

5.6.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors are included in Tables 5.1 and 5.1 in both Appendices H and I (for *Lab Area Underground Sewer Lines* and *Lab Area Surface Soil and Wetland Area*, respectively). The uncertainty associated with CSFs are mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be straight line responses. This is a conservative assumption, introducing a high uncertainty into slope factors, which are from this extrapolated area of the dose-response curve; however, most of the experimental studies indicate existence of a threshold for carcinogenicity.

Carcinogenic slope factors developed by the USEPA represent upper bound estimates. Any carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value.

Additional uncertainty is in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

5.6.4 Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity, synergism, potentiation, susceptibility of exposed receptors, and so on.

In general, assessment of uncertainty is very important for sites with contaminant concentrations presenting a risk at the acceptable limit level with questionable exceedance (e.g., slightly above the upper bound risk ranges of 1 in 10,000 risk or HI of 1.0).

5.7 Summary

This HHRA was conducted to evaluate the potential human health risks associated with the presence of site-related surface soil, subsurface soil, surface water, and sediment contamination at the Lab Area. Potential risks were calculated for a current/future industrial worker, current/future other worker, current/future adult trespasser/visitor, current/future adolescent trespasser/visitor, current/future adult other recreational person, current/future child other recreational person, future adult resident, future child resident, future lifetime resident, and future construction worker. This baseline risk assessment was conducted to characterize the potential current and future human health risks at the Lab Area if no additional remediation is implemented.

In Appendix H, Tables 9.1.RME through 9.9.RME, 9.10.CT, and 9.13.CT summarize the RME and CT potential hazards and risks to each receptor for the *Lab Area Underground Sewer Lines Area*. In Appendix I, Tables 9.1.RME through 9.9.RME, 9.10.CT, and 9.16.CT summarize the RME and CT potential hazards and risks to each receptor for the *Lab Area Surface Soil and Wetland Area*. Tables 10.1.RME through 10.4.RME in both Appendices H and I show only those pathways with total HIs greater than 1.0 or total carcinogenic risks greater than 10^{-5}.

No calculated carcinogenic risks were above USEPA's acceptable risk range. Subsurface soil in the *Lab Area Underground Sewer Lines* and surface soil and sediment in the *Lab Area Surface Soil and Wetland Area* were the only media that had noncarcinogenic hazards greater than the USEPA target levels. The main risk drivers for these media were:

- *Lab Area Underground Sewer Lines* – Subsurface Soil
  - Mercury
- *Lab Area Surface Soil and Wetland Area* –Sediment
  - Arsenic
- *Lab Area Surface Soil and Wetland Area* – Surface Soil
  - Mercury
  - Lead (future potential health concern for small children residing near Buildings 102, 103 and 304, only, and current/future health concern for adult industrial workers (and their unborn fetuses working near Buildings 102, 103, and 304, only).

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Table 5-1
Summary of Data Quantitatively Used in Risk Assessment
Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines
Lab Area RI
Naval District Washington, Indian Head
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Soil			
Subsurface Soil	05/15/2001	IS49SB010405	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS49SB020708	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS49SB02P0708	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS49SB030607	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS49SB050507	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS49SB060507	EXPLO, METAL, SVOA, VOA
	05/07/2001	IS53SB010608	METAL
	05/07/2001	IS53SB01P0608	METAL
	05/07/2001	IS53SB020204	METAL
	05/07/2001	IS53SB031416	METAL
	05/07/2001	IS53SB041112	METAL
	05/07/2001	IS53SB061214	METAL
	05/07/2001	IS53SB071415	METAL
	05/07/2001	IS53SB081314	METAL
	05/07/2001	IS53SB090507	METAL
	05/07/2001	IS53SB100405	METAL
	05/07/2001	IS53SB110406	METAL
	05/08/2001	IS53SB120304	METAL
	05/08/2001	IS53SB130304	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS53SB140304	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS53SB150304	EXPLO, METAL, SVOA, VOA
	05/08/2001	IS53SB160304	EXPLO, METAL, SVOA, VOA
	05/07/2001	IS53SB170102	EXPLO, METAL, SVOA, VOA
	05/07/2001	IS53SB180607	METAL
	05/07/2001	IS53SB191214	METAL
	05/07/2001	IS53SB200506	METAL
	05/07/2001	IS53SB20P0506	METAL
	05/07/2001	IS53SB210607	METAL
	05/07/2001	IS53SB220405	METAL
	05/08/2001	IS53SB230708	METAL
	05/08/2001	IS53SB240910	METAL
Sediment	05/03/2001	IS53SD01	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD02	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD04	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD05	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD06	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD07	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD09	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD10	EXPLO, METAL, SVOA, VOA
	05/03/2001	IS53SD10P	EXPLO, METAL, SVOA, VOA

Table 5-2
Summary of Data Quantitatively Used in Risk Assessment
Lab Area Surface Soil and Wetland Area
Lab Area RI
Naval District Washington, Indian Head
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Soil			
Surface Soil	05/02/2001	IS49SS010001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS49SS020001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS010001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS020001	EXPLO, METAL
	05/01/2001	IS53SS030001	EXPLO, METAL
	05/01/2001	IS53SS040001	EXPLO, METAL
	05/01/2001	IS53SS050001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS060001	EXPLO, METAL
	05/01/2001	IS53SS070001	EXPLO, METAL
	05/01/2001	IS53SS080001	EXPLO, METAL
	05/01/2001	IS53SS090001	EXPLO, METAL
	05/01/2001	IS53SS100001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS10P0001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS110001	EXPLO, METAL
	05/01/2001	IS53SS120001	EXPLO, METAL
	05/01/2001	IS53SS130001	EXPLO, METAL
	05/01/2001	IS53SS140001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS150001	EXPLO, METAL
	05/01/2001	IS53SS160001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS170001	EXPLO, METAL
	05/01/2001	IS53SS180001	EXPLO, METAL
	05/01/2001	IS53SS190001	EXPLO, METAL
	05/01/2001	IS53SS200001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS20P0001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS210001	EXPLO, METAL
	05/01/2001	IS53SS220001	EXPLO, METAL
	05/01/2001	IS53SS230001	EXPLO, METAL
	05/01/2001	IS53SS240001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS250001	EXPLO, METAL
	05/01/2001	IS53SS260001	EXPLO, METAL
	05/01/2001	IS53SS26P0001	EXPLO, METAL
	05/01/2001	IS53SS270001	EXPLO, METAL
	05/01/2001	IS53SS280001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS290001	EXPLO, METAL
	05/01/2001	IS53SS300001	EXPLO, METAL
	05/01/2001	IS53SS310001	EXPLO, METAL
	05/01/2001	IS53SS320001	EXPLO, METAL
	05/01/2001	IS53SS330001	EXPLO, METAL
	05/01/2001	IS53SS340001	EXPLO, METAL
	05/01/2001	IS53SS350001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS35P0001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS360001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS370001	EXPLO, METAL
	05/01/2001	IS53SS380001	EXPLO, METAL
	05/01/2001	IS53SS390001	EXPLO, METAL, SVOA, VOA
	05/01/2001	IS53SS400001	EXPLO, METAL
	05/01/2001	IS53SS410001	EXPLO, METAL
	05/01/2001	IS53SS41P0001	EXPLO
	05/02/2001	IS53SS420001	EXPLO, METAL
	05/02/2001	IS53SS430001	EXPLO, METAL
	05/02/2001	IS53SS440001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS450001	EXPLO, METAL
	05/02/2001	IS53SS460001	EXPLO, METAL
	05/02/2001	IS53SS470001	EXPLO, METAL
	05/02/2001	IS53SS480001	EXPLO, METAL
	05/02/2001	IS53SS490001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS500001	EXPLO, METAL
	05/02/2001	IS53SS510001	EXPLO, METAL
	05/02/2001	IS53SS520001	EXPLO, METAL
	05/02/2001	IS53SS530001	EXPLO, METAL
	05/02/2001	IS53SS540001	EXPLO, METAL
	05/02/2001	IS53SS550001	EXPLO, METAL
	05/02/2001	IS53SS560001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS570001	EXPLO, METAL
	05/02/2001	IS53SS580001	EXPLO, METAL
	05/02/2001	IS53SS590001	EXPLO, METAL
	05/02/2001	IS53SS600001	EXPLO, METAL
	05/02/2001	IS53SS60P0001	EXPLO, METAL

Table 5-2
Summary of Data Quantitatively Used in Risk Assessment
Lab Area Surface Soil and Wetland Area
Lab Area RI
Naval District Washington, Indian Head
Indian Head, Maryland

Medium	Date of Sampling	Sample	Parameters
Surface Soil continued	05/02/2001	IS53SS610001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS620001	EXPLO, METAL
	05/02/2001	IS53SS630001	EXPLO, METAL
	05/02/2001	IS53SS640001	EXPLO, METAL
	05/02/2001	IS53SS650001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS660001	EXPLO, METAL
	05/02/2001	IS53SS66P0001	EXPLO, METAL
	05/02/2001	IS53SS670001	EXPLO, METAL
	05/02/2001	IS53SS680001	EXPLO, METAL
	05/02/2001	IS53SS690001	EXPLO, METAL
	05/02/2001	IS53SS700001	EXPLO, METAL
	05/02/2001	IS53SS710001	EXPLO, METAL, SVOA, VOA
	05/02/2001	IS53SS720001	EXPLO, METAL
	05/02/2001	IS53SS730001	EXPLO, METAL
	05/02/2001	IS53SS740001	EXPLO, METAL
	05/02/2001	IS53SS74P0001	EXPLO, METAL
	05/02/2001	IS53SS750001	EXPLO, METAL
	05/02/2001	IS53SS760001	EXPLO, METAL
	05/02/2001	IS53SS770001	EXPLO, METAL
	05/02/2001	IS53SS780001	EXPLO, METAL,
Sediment	05/02/2001	IS53SD14	EXPLO, METAL, SVOA
	05/02/2001	IS53SD14P	EXPLO, METAL, SVOA
	05/02/2001	IS53SD15	EXPLO, METAL,
	05/02/2001	IS53SD16*	EXPLO, METAL,
	05/02/2001	IS53SD17*	EXPLO, METAL,
	05/02/2001	IS53SD18*	EXPLO, METAL, SVOA
	05/02/2001	IS53SD19*	EXPLO, METAL,
Surface Water	05/03/2001	IS53SW01	EXPLO, METAL, SVOA
	05/03/2001	IS53SW01P	EXPLO, METAL, SVOA

* Classified as surface soil samples since there was no water at these locations.

Table 5-3
Summary of Chemicals of Potential Concern for the HHRA
Lab Area Underground Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Subsurface Soil	Sediment
Aluminum	Arsenic
Arsenic	Iron
Chromium	Lead
Iron	Manganese
Lead	Mercury
Manganese	
Mercury	
Thallium	

Table 5-4
Summary of Chemicals of Potential Concern for the HHRA
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Surface Soil		Sediment	Surface Water
Benzo(a)anthracene	Benzo(a)pyrene	Arsenic	Arsenic
Benzo(b)fluoranthene	Dibenz(a,h)anthracene	Mercury	Manganese
Indeno(1,2,3-cd)pyrene	2-Amino-4,6-dinitrotoluene		
Aluminum	Antimony		
Arsenic	Barium		
Cadmium	Chromium		
Copper	Iron		
Manganese	Mercury		
Thallium	Zinc		

Table 5-5
Exposure Pathways

Lab Area Underground Sewer Lines
Lab Area Remedial Investigation Report

Naval District Washington, Indian Head
Indian Head, Maryland

Media	Exposure Route	Current	Future						
		Other Worker	Industrial Worker	Other Worker	Construction Worker	Trespasser /Visitor Adult	Trespasser /Visitor Adolescent	Resident Adult	Resident Child
Subsurface Soil									
	Ingestion	X	X		X	X	X	X	X
	Dermal	X	X		X	X	X	X	X
	Inhalation	X	X		X			X	X
Sediment									
	Ingestion	X*	X	X*					
	Dermal	X*	X	X*					
	Inhalation		X						

X Quantitative evaluation.
* Current and Future scenario are the same.

Table 5-6
Exposure Pathways
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media	Exposure Route	Current/Future					Future		
		Industrial Worker	Trespasser /Visitor		Other Recreational		Construction Worker	Resident	
			Adult	Adolescents	Person Adult	Person Child		Adult	Child
Surface Soil									
	Ingestion	X	X	X			X	X	X
	Dermal	X	X	X			X	X	X
	Inhalation	X	X	X			X	X	X
Sediment									
	Ingestion				X	X			
	Dermal				X	X			
	Inhalation								
Surface Water									
	Ingestion				X	X			
	Dermal				X	X			
	Inhalation								

X Quantitative evaluation.

Table 5-7
Summary of Media-Specific Risks and Hazards For RME
Lab Area Underground Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Subsurface Soil

	Current Other Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	N/A	0.001	0.001	**0.002**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.006	0.003	**0.009**	N/A	9.1E-07	5.2E-07	**1.4E-06**
Chromium	N/A	0.0007	0.01	**0.01**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.009	0.008	**0.02**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.0004	0.0002	**0.0006**	N/A	N/A	N/A	**N/A**
Mercury	0.08	0.02	0.003	**0.10**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.001	0.0002	**0.001**	N/A	N/A	N/A	**N/A**
Totals	**0.08**	**0.04**	**0.03**	**0.1**	**N/A**	**9.1E-07**	**5.2E-07**	**1.4E-06**

	Future Construction Worker								Future Industrial Worker							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	N/A	0.05	0.005	**0.06**	N/A	N/A	N/A	**0.0E+00**	N/A	0.01	0.001	**0.01**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.2	0.02	**0.2**	N/A	1.4E-06	1.3E-07	**1.6E-06**	N/A	0.05	0.003	**0.1**	N/A	7.5E-06	4.3E-06	**1.2E-05**
Chromium	N/A	0.004	0.01	**0.01**	N/A	N/A	N/A	**0.0E+00**	N/A	0.01	0.01	**0.02**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.4	0.05	**0.4**	N/A	N/A	N/A	**0.0E+00**	N/A	0.1	0.01	**0.1**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.01	0.001	**0.02**	N/A	N/A	N/A	**0.0E+00**	N/A	0.003	0.0002	**0.003**	N/A	N/A	N/A	**N/A**
Mercury	0.7	0.7	0.02	**1.5**	N/A	N/A	N/A	**0.0E+00**	0.2	0.2	0.003	**0.4**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.05	0.001	**0.05**	N/A	N/A	N/A	**0.0E+00**	N/A	0.01	0.0002	**0.01**	N/A	N/A	N/A	**N/A**
Totals	**0.7**	**1.4**	**0.1**	**2.3**	**N/A**	**1.4E-06**	**1.3E-07**	**1.6E-06**	**0.2**	**0.3**	**0.03**	**0.6**	**N/A**	**7.5E-06**	**4.3E-06**	**1.2E-05**

	Future Resident Adult								Future Resident Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	N/A	0.01	0.006	**0.02**	N/A	N/A	N/A	**N/A**	N/A	0.1	0.007	**0.1**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.07	0.03	**0.09**	N/A	N/A	N/A	**N/A**	N/A	0.6	0.03	**0.6**	N/A	N/A	N/A	**N/A**
Chromium	N/A	0.008	0.09	**0.1**	N/A	N/A	N/A	**N/A**	N/A	0.07	0.1	**0.2**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.1	0.06	**0.2**	N/A	N/A	N/A	**N/A**	N/A	1	0.06	**1**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.004	0.001	**0.006**	N/A	N/A	N/A	**N/A**	N/A	0.04	0.002	**0.04**	N/A	N/A	N/A	**N/A**
Mercury	1.0	0.2	0.02	**1.2**	N/A	N/A	N/A	**N/A**	2.8	2	0.03	**5**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.01	0.002	**0.02**	N/A	N/A	N/A	**N/A**	N/A	0.1	0.002	**0.1**	N/A	N/A	N/A	**N/A**
Totals	**1.0**	**0.4**	**0.2**	**1.6**	**N/A**	**N/A**	**N/A**	**N/A**	**2.8**	**4**	**0.2**	**7.0**	**N/A**	**N/A**	**N/A**	**N/A**

Table 5-7
Summary of Media-Specific Risks and Hazards For RME
Lab Area Underground Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Subsurface Soil (continued)

	Future Age-Adjusted Resident[a]							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	N/A	N/A	**N/A**	N/A	3.4E-05	5.0E-06	**3.9E-05**
Chromium	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Iron	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Manganese	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Mercury	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Thallium	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	**N/A**
Totals	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3.4E-05**	**5.0E-06**	**3.9E-05**

*** - sum of cancer risks between residential adult and child.**

Media: Sediment

	Current/Future Other Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Arsenic	N/A	0.007	0.003	**0.01**	N/A	1.1E-06	5.2E-07	**N/A**
Iron	N/A	0.03	0.02	**0.05**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.01	0.006	**0.02**	N/A	N/A	N/A	**N/A**
Mercury	N/A	0.5	0.07	**0.6**	N/A	N/A	N/A	**N/A**
Totals	**NA**	**0.6**	**0.1**	**0.7**	**N/A**	**1.1E-06**	**5.2E-07**	**1.6E-06**

	Future Industrial Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Arsenic	N/A	0.003	0.002	**0.005**	N/A	5.3E-07	2.6E-07	**7.9E-07**
Iron	N/A	0.02	0.01	**0.03**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.01	0.003	**0.01**	N/A	N/A	N/A	**N/A**
Mercury	N/A	0.3	0.04	**0.3**	N/A	N/A	N/A	**N/A**
Totals	**NA**	**0.3**	**0.05**	**0.3**	**N/A**	**5.3E-07**	**2.6E-07**	**7.9E-07**

Table 5-8
Summary of Media-Specific Risks and Hazards For RME
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Surface Soil

	Current/Future Industrial Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	N/A	2.4E-07	N/A	**2.4E-07**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	N/A	2.1E-06	N/A	**2.1E-06**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	N/A	3.0E-07	N/A	**3.0E-07**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	N/A	5.3E-07	N/A	**5.3E-07**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	N/A	8.3E-08	N/A	**8.3E-08**
2-Amino-4,6-dinitrotoluene	N/A	0.005	0.01	**0.02**	N/A	N/A	N/A	**N/A**
Aluminum	N/A	0.006	0.004	**0.009**	N/A	N/A	N/A	**N/A**
Antimony	N/A	0.003	0.006	**0.01**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.04	0.02	**0.06**	N/A	6.5E-06	3.7E-06	**1.0E-05**
Barium	N/A	0.001	0.0002	**0.001**	N/A	N/A	N/A	**N/A**
Cadmium	N/A	0.003	0.02	**0.02**	N/A	N/A	N/A	**N/A**
Chromium	N/A	0.007	0.1	**0.1**	N/A	N/A	N/A	**N/A**
Copper	N/A	0.002	0.0007	**0.003**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.04	0.03	**0.07**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.01	0.005	**0.02**	N/A	N/A	N/A	**N/A**
Mercury	1.1	0.7	0.1	**2.0**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.01	0.002	**0.01**	N/A	N/A	N/A	**N/A**
Zinc	N/A	0.002	0.001	**0.003**	N/A	N/A	N/A	**N/A**
Totals	**1.1**	**0.9**	**0.3**	**2.3**	**N/A**	**9.8E-06**	**3.7E-06**	**1.4E-05**

	Current/Future Trespasser/Visitor Adult								Current/Future Trespasser/Visitor Adolescent							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	N/A	4.9E-08	N/A	**4.9E-08**	N/A	N/A	N/A	**N/A**	N/A	3.5E-08	N/A	**3.5E-08**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	N/A	4.3E-07	N/A	**4.3E-07**	N/A	N/A	N/A	**N/A**	N/A	3.0E-07	N/A	**3.0E-07**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	N/A	6.0E-08	N/A	**6.0E-08**	N/A	N/A	N/A	**N/A**	N/A	4.2E-08	N/A	**4.2E-08**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	N/A	1.1E-07	N/A	**1.1E-07**	N/A	N/A	N/A	**N/A**	N/A	7.5E-08	N/A	**7.5E-08**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	N/A	1.7E-08	N/A	**1.7E-08**	N/A	N/A	N/A	**N/A**	N/A	1.2E-08	N/A	**1.2E-08**
2-Amino-4,6-dinitrotoluene	N/A	0.001	0.0008	**0.002**	N/A	N/A	N/A	**N/A**	N/A	0.0002	0.001	**0.002**	N/A	N/A	N/A	**N/A**
Aluminum	N/A	0.001	0.0003	**0.001**	N/A	N/A	N/A	**N/A**	N/A	0.0002	0.0004	**0.0007**	N/A	N/A	N/A	**N/A**
Antimony	N/A	0.0007	0.0004	**0.001**	N/A	N/A	N/A	**N/A**	N/A	0.0001	0.0007	**0.0008**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.008	0.002	**0.01**	N/A	1.3E-06	2.6E-07	**1.6E-06**	N/A	0.002	0.003	**0.004**	N/A	9.3E-07	8.3E-08	**1.0E-06**
Barium	N/A	0.0002	0.00001	**0.0002**	N/A	N/A	N/A	**N/A**	N/A	0.00004	0.00002	**0.00006**	N/A	N/A	N/A	**N/A**
Cadmium	N/A	0.0006	0.002	**0.002**	N/A	N/A	N/A	**N/A**	N/A	0.0001	0.002	**0.003**	N/A	N/A	N/A	**N/A**
Chromium	N/A	0.001	0.008	**0.009**	N/A	N/A	N/A	**N/A**	N/A	0.0003	0.01	**0.01**	N/A	N/A	N/A	**N/A**
Copper	N/A	0.0005	0.00005	**0.0006**	N/A	N/A	N/A	**N/A**	N/A	0.0001	0.00008	**0.0002**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.008	0.002	**0.01**	N/A	N/A	N/A	**N/A**	N/A	0.002	0.004	**0.006**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.002	0.0004	**0.003**	N/A	N/A	N/A	**N/A**	N/A	0.0004	0.0006	**0.001**	N/A	N/A	N/A	**N/A**
Mercury	0.05	0.2	0.009	**0.2**	N/A	N/A	N/A	**N/A**	0.1	0.03	0.01	**0.14**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.002	0.0001	**0.002**	N/A	N/A	N/A	**N/A**	N/A	0.0004	0.0002	**0.0006**	N/A	N/A	N/A	**N/A**
Zinc	N/A	0.0004	0.00009	**0.0005**	N/A	N/A	N/A	**N/A**	N/A	0.00007	0.0001	**0.0002**	N/A	N/A	N/A	**N/A**
Totals	**0.05**	**0.2**	**0.02**	**0.3**	**N/A**	**2.0E-06**	**2.6E-07**	**2.2E-06**	**0.10**	**0.03**	**0.04**	**0.2**	**N/A**	**1.4E-06**	**8.3E-08**	**1.5E-06**

Table 5-8
Summary of Media-Specific Risks and Hazards For RME
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Sediment

	Current/Future Other Recreational Person Adult								Current/Future Other Recreational Person Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Arsenic	N/A	0.01	8.6	**8.6**	N/A	1.1E-06	1.3E-04	**1.3E-04**	N/A	0.06	12.0	**12.1**	N/A	2.5E-06	4.6E-05	**4.9E-05**
Mercury	N/A	0.008	0.3	**0.3**	N/A	N/A	N/A	**N/A**	N/A	0.08	0.4	**0.5**	N/A	N/A	N/A	**N/A**
Totals	**N/A**	**0.02**	**8.9**	**9**	**N/A**	**1.1E-06**	**1.3E-04**	**1.3E-04**	**N/A**	**0.14**	**12.5**	**12.6**	**N/A**	**2.5E-06**	**4.6E-05**	**4.9E-05**

Media: Surface Water

	Current/Future Other Recreational Person Adult								Current/Future Other Recreational Person Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Arsenic	N/A	0.0003	0.0002	**0.0005**	N/A	1.3E-06	6.4E-06	**7.7E-06**	N/A	0.006	0.0002	**0.007**	N/A	7.5E-06	2.2E-06	**9.7E-06**
Mercury	N/A	0.01	0.3	**0.3**	N/A	N/A	N/A	**N/A**	N/A	0.2	0.4	**0.6**	N/A	N/A	N/A	**N/A**
Totals	**N/A**	**0.01**	**0.3**	**0.3**	**N/A**	**1.3E-06**	**6.4E-06**	**7.7E-06**	**N/A**	**0.2**	**0.4**	**0.6**	**N/A**	**7.5E-06**	**2.2E-06**	**9.7E-06**

Media: Surface Soil

	Future Construction Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	N/A	4.7E-08	N/A	**4.7E-08**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	N/A	4.1E-07	N/A	**4.1E-07**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	N/A	5.7E-08	N/A	**5.7E-08**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	N/A	1.0E-07	N/A	**1.0E-07**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	N/A	1.6E-08	N/A	**1.6E-08**
2-Amino-4,6-dinitrotoluene	N/A	0.03	0.008	**0.03**	N/A	N/A	N/A	**N/A**
Aluminum	N/A	0.03	0.003	**0.03**	N/A	N/A	N/A	**N/A**
Antimony	N/A	0.02	0.004	**0.02**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.2	0.02	**0.2**	N/A	1.3E-06	1.1E-07	**1.4E-06**
Barium	N/A	0.005	0.0001	**0.005**	N/A	N/A	N/A	**N/A**
Cadmium	N/A	0.01	0.02	**0.03**	N/A	N/A	N/A	**N/A**
Chromium	N/A	0.005	0.08	**0.09**	N/A	N/A	N/A	**N/A**
Copper	N/A	0.01	0.0005	**0.01**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.2	0.03	**0.2**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.05	0.004	**0.06**	N/A	N/A	N/A	**N/A**
Mercury	3.4	3.5	0.09	**7.0**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.05	0.001	**0.05**	N/A	N/A	N/A	**N/A**
Zinc	N/A	0.01	0.001	**0.01**	N/A	N/A	N/A	**N/A**
Totals	**3.4**	**4.1**	**0.3**	**7.7**	**N/A**	**1.9E-06**	**1.1E-07**	**2.0E-06**

Table 5-8
Summary of Media-Specific Risks and Hazards For RME
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Surface Soil (continued)

	Future Resident Adult								Future Resident Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
2-Amino-4,6-dinitrotoluene	N/A	0.007	0.01	**0.02**	--	--	--	**--**	N/A	0.07	0.01	**0.08**	--	--	--	**--**
Aluminum	N/A	0.008	0.003	**0.01**	--	--	--	**--**	N/A	0.08	0.004	**0.08**	--	--	--	**--**
Antimony	N/A	0.005	0.005	**0.01**	--	--	--	**--**	N/A	0.04	0.006	**0.05**	--	--	--	**--**
Arsenic	N/A	0.06	0.02	**0.1**	--	--	--	**--**	N/A	0.5	0.02	**0.6**	--	--	--	**--**
Barium	N/A	0.001	0.0002	**0.002**	--	--	--	**--**	N/A	0.01	0.0002	**0.01**	--	--	--	**--**
Cadmium	N/A	0.004	0.02	**0.02**	--	--	--	**--**	N/A	0.04	0.02	**0.06**	--	--	--	**--**
Chromium	N/A	0.009	0.1	**0.1**	--	--	--	**--**	N/A	0.09	0.1	**0.2**	--	--	--	**--**
Copper	N/A	0.003	0.0007	**0.004**	--	--	--	**--**	N/A	0.03	0.0007	**0.03**	--	--	--	**--**
Iron	N/A	0.06	0.03	**0.09**	--	--	--	**--**	N/A	0.5	0.03	**0.6**	--	--	--	**--**
Manganese	N/A	0.02	0.005	**0.02**	--	--	--	**--**	N/A	0.1	0.005	**0.1**	--	--	--	**--**
Mercury	4.7	1.0	0.1	**5.9**	--	--	--	**--**	13	10	0.1	**23**	--	--	--	**--**
Thallium	N/A	0.01	0.002	**0.02**	--	--	--	**--**	N/A	0.1	0.002	**0.1**	--	--	--	**--**
Zinc	N/A	0.003	0.001	**0.004**	--	--	--	**--**	N/A	0.02	0.001	**0.02**	--	--	--	**--**
Totals	**4.7**	**1.2**	**0.3**	**6.3**	**--**	**--**	**--**	**--**	**13**	**11**	**0.3**	**25**	**--**	**--**	**--**	**--**

	Future Resident Adult/Child							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	--	--	--	**--**	N/A	1.1E-06	N/A	**1.1E-06**
Benzo(a)pyrene	--	--	--	**--**	N/A	9.6E-06	N/A	**9.6E-06**
Benzo(b)fluoranthene	--	--	--	**--**	N/A	1.3E-06	N/A	**1.3E-06**
Dibenz(a,h)anthracene	--	--	--	**--**	N/A	2.4E-06	N/A	**2.4E-06**
Indeno(1,2,3-cd)pyrene	--	--	--	**--**	N/A	3.7E-07	N/A	**3.7E-07**
2-Amino-4,6-dinitrotoluene	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Aluminum	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Antimony	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Arsenic	--	--	--	**--**	N/A	2.9E-05	4.3E-06	**3.4E-05**
Barium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Cadmium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Chromium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Copper	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Iron	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Manganese	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Mercury	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Thallium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Zinc	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Totals	**--**	**--**	**--**	**--**	**N/A**	**4.4E-05**	**4.3E-06**	**4.8E-05**

Table 5-9
Summary Table for All Pathways for All RME Exposure Scenarios
Lab Area Undergeound Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Pathways						Total Risk for Pathways	Total HI for Pathways	Percent Contribution by Pathway					
	Inhalation		Ingestion		Dermal				Inhalation		Ingestion		Dermal	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Subsurface Soil														
Current Other Worker	--	0.08	9.1E-07	0.04	5.2E-07	0.03	**1.4E-06**	**0.1**	57%	--	64%	25%	36%	18%
Future Construction Worker	--	0.7	1.4E-06	1.4	1.3E-07	0.1	**1.6E-06**	**2**	32%	--	92%	64%	8%	4%
Future Industrial Worker	--	0.2	7.5E-06	0.3	4.3E-06	0.03	**1.2E-05**	**0.6**	42%	--	64%	54%	36%	5%
Future Resident Adult	--	1	--	0.4	--	0.2	--	**2**	61%	--	--	26%	--	13%
Future Resident Child	--	3	--	4	--	0.2	--	**7**	40%	--	--	57%	--	3%
Future Age-Adjusted Resident	--	--	3.4E-05	--	5.0E-06	--	**4.4E-05**	--	--	--	77%	--	11%	--
Sediment														
Current/Future Other Worker	--	--	1.1E-06	0.6	5.2E-07	0.1	**1.6E-06**	**0.7**	--	--	67%	84%	33%	16%
Future Industrial Worker	--	--	5.3E-07	0.3	2.6E-07	0.05	**7.9E-07**	**0.3**	--	--	67%	84%	33%	16%

Risk = carcinogenic risk as determined by the risk calculations in Appendix.
HI = Hazard index as determined by the risk calculation in Appendix.

Table 5-10
Summary Table for All Pathways for All RME Exposure Scenarios
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Pathways						Total Risk for Pathways	Total HI for Pathways	Percent Contribution by Pathway					
	Inhalation		Ingestion		Dermal				Inhalation		Ingestion		Dermal	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Surface Soil														
Current/Future Industrial Worker	N/A	1.1	9.8E-06	0.9	3.7E-06	0.3	**1.4E-05**	**2.3**	--	50%	72%	38%	28%	12%
Current/Future Trespasser/Visitor Adult	N/A	0.05	2.0E-06	0.2	2.6E-07	0.02	**2.2E-06**	**0.2**	--	22%	88%	70%	12%	8%
Current/Future Trespasser/Visitor Child	N/A	0.1	1.4E-06	0.03	8.3E-08	0.04	**1.5E-06**	**0.2**	--	57%	94%	19%	6%	23%
Future Construction Worker	N/A	3.4	1.9E-06	4	1.1E-07	0.3	**2.0E-06**	**7.7**	--	44%	94%	53%	6%	3%
Future Resident Adult	--	4.7	--	1	--	0.3	**--**	**6.3**	--	76%	--	19%	--	5%
Future Resident Child	--	13	--	11	--	0.3	**--**	**25**	--	53%	--	45%	--	1%
Future Resident Adult/Child	N/A	--	4.4E-05	--	4.3E-06	--	**4.8E-05**	**--**	--	--	91%	--	9%	--
Sediment														
Current/Future Recreational Person Adult	N/A	N/A	1.1E-06	0.02	1.3E-04	8.9	**1.3E-04**	**8.9**	--	--	1%	0%	99%	100%
Current/Future Recreational Person Child	N/A	N/A	2.5E-06	0.14	4.6E-05	12.5	**4.9E-05**	**12.6**	--	--	5%	1%	95%	99%
Surface Water														
Current/Future Recreational Person Adult	N/A	N/A	1.3E-06	0.01	6.4E-06	0.3	**7.7E-06**	**0.3**	--	--	17%	4%	83%	96%
Current/Future Recreational Person Child	N/A	N/A	7.5E-06	0.2	2.2E-06	0.4	**9.7E-06**	**0.6**	--	--	77%	40%	23%	60%

Risk = carcinogenic risk as determined by the risk calculations in Appendix.
HI = Hazard index as determined by the risk calculation in Appendix.
N/A - not calculated.

Table 5-11
Summary Table for Risks and Hazards Across Media for RMEs
Lab Area Undergeound Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Scenarios				Total Risk for Pathways	Total HI for Pathways	Exposure Scenarios			
	Subsurface Soil		Sediment				Subsurface Soil		Sediment	
	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI
Current Other Worker	1E-06	0.15	2E-06	0.7	**3E-06**	**0.8**	47%	18%	53%	82%
Future Construction Worker	2E-06	2.3	--	--	**2E-06**	**2.3**	100%	100%	--	--
Future Industrial Worker	1E-05	0.6	8E-07	0.3	**1E-05**	**0.9**	94%	63%	6%	37%
Future Other Worker	--	--	2E-06	0.7	**2E-06**	**0.7**	--	--	100%	100%
Future Resident Adult	--	1.6	--	--	**--**	**1.6**	--	100%	--	--
Future Resident Child	--	7.0	--	--	**--**	**7.0**	--	100%	--	--
Future Age-Adjusted Resident	4E-05	--	--	--	**4E-05**	**--**	100%	--	--	--

Table 5-12
Summary Table for Risks and Hazards Across Media for RMEs
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Scenarios						Total Risk for Pathways	Total HI for Pathways	Exposure Scenarios					
	Surface Soil		Sediment		Surface Water				Surface Soil		Sediment		Surface Water	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Current/Future Industrial Worker	1.4E-05	2.3	--	--	--	--	**1.4E-05**	**2.3**	100%	100%	--	--	--	--
Current/Future Trespasser/Visitor Adult	2.2E-06	0.2	--	--	--	--	**2.2E-06**	**0.2**	100%	100%	--	--	--	--
Current/Future Trespasser/Visitor Child	1.5E-06	0.17	--	--	--	--	**1.5E-06**	**0.2**	100%	100%	--	--	--	--
Future Construction Worker	2.0E-06	8	--	--	--	--	**2.0E-06**	**8**	100%	100%	--	--	--	--
Future Resident Adult	--	6	--	--	--	--	**--**	**6**	--	100%	--	--	--	--
Future Resident Child	--	25	--	--	--	--	**--**	**25**	--	100%	--	--	--	--
Future Resident Adult/Child	4.8E-05	--	--	--	--	--	**4.8E-05**	**--**	100%	--	--	--	--	--
Current/Future Recreational Person Adult	--	--	1.3E-04	8.9	7.7E-06	0.3	**1.4E-04**	**9**	--	--	95%	97%	5%	3%
Current/Future Recreational Person Child	--	--	4.9E-05	12.6	9.7E-06	0.6	**5.9E-05**	**13**	--	--	83%	96%	17%	4%

Table 5-13
Summary of Media-Specific Risks and Hazards For CT
Lab Area Underground Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Subsurface Soil

	Future Industrial Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	--	--	--	--	N/A	N/A	N/A	**N/A**
Arsenic	--	--	--	--	N/A	6.6E-07	2.7E-07	**9.3E-07**
Chromium	--	--	--	--	N/A	N/A	N/A	**N/A**
Iron	--	--	--	--	N/A	N/A	N/A	**N/A**
Manganese	--	--	--	--	N/A	N/A	N/A	**N/A**
Mercury	--	--	--	--	N/A	N/A	N/A	**N/A**
Thallium	--	--	--	--	N/A	N/A	N/A	**N/A**
Totals	--	--	--	--	**N/A**	**6.6E-07**	**2.7E-07**	**9.3E-07**

	Future Construction Worker								Future Resident Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	N/A	0.008	0.001	**0.009**	--	--	--	--	N/A	0.04	0.003	**0.04**	--	--	--	--
Arsenic	N/A	0.01	0.001	**0.01**	--	--	--	--	N/A	0.05	0.004	**0.05**	--	--	--	--
Chromium	N/A	0.001	0.02	**0.02**	--	--	--	--	N/A	0.02	0.05	**0.07**	--	--	--	--
Iron	N/A	0.06	0.01	**0.07**	--	--	--	--	N/A	0.3	0.03	**0.3**	--	--	--	--
Manganese	N/A	0.002	0.0002	**0.002**	--	--	--	--	N/A	0.01	0.001	**0.01**	--	--	--	--
Mercury	N/A	0.001	0.00004	**0.001**	--	--	--	--	0.02	0.01	0.0001	**0.02**	--	--	--	--
Thallium	N/A	0.007	0.0002	**0.007**	--	--	--	--	N/A	0.03	0.0008	**0.03**	--	--	--	--
Totals	N/A	0.09	0.03	**0.1**	--	--	--	--	**0.02**	**0.4**	**0.09**	**0.5**	--	--	--	--

	Future Age-Adjusted Resident*							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Aluminum	--	--	--	--	N/A	N/A	N/A	**N/A**
Arsenic	--	--	--	--	N/A	2.2E-06	3.6E-07	**2.6E-06**
Chromium	--	--	--	--	N/A	N/A	N/A	**N/A**
Iron	--	--	--	--	N/A	N/A	N/A	**N/A**
Manganese	--	--	--	--	N/A	N/A	N/A	**N/A**
Mercury	--	--	--	--	N/A	N/A	N/A	**N/A**
Thallium	--	--	--	--	N/A	N/A	N/A	**N/A**
Totals	--	--	--	--	**N/A**	**2.2E-06**	**3.6E-07**	**2.6E-06**

*** - sum of cancer risks between residential adult and child.**

Table 5-14
Summary of Media-Specific Risks and Hazards For CT
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Surface Soil

	Current/Future Industrial Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	N/A	5.2E-09	N/A	**5.2E-09**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	N/A	4.9E-08	N/A	**4.9E-08**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	N/A	6.4E-09	N/A	**6.4E-09**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	N/A	4.4E-08	N/A	**4.4E-08**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	N/A	2.6E-09	N/A	**2.6E-09**
2-Amino-4,6-dinitrotoluene	N/A	0.002	0.003	**0.01**	N/A	N/A	N/A	**N/A**
Aluminum	N/A	0.002	0.001	**0.003**	N/A	N/A	N/A	**N/A**
Antimony	N/A	0.001	0.001	**0.002**	N/A	N/A	N/A	**N/A**
Arsenic	N/A	0.01	0.004	**0.01**	N/A	3.4E-07	1.4E-07	**4.8E-07**
Barium	N/A	0.0003	0.00004	**0.0003**	N/A	N/A	N/A	**N/A**
Cadmium	N/A	0.0002	0.001	**0.001**	N/A	N/A	N/A	**N/A**
Chromium	N/A	0.002	0.03	**0.03**	N/A	N/A	N/A	**N/A**
Copper	N/A	0.0003	0.0001	**0.0004**	N/A	N/A	N/A	**N/A**
Iron	N/A	0.01	0.009	**0.02**	N/A	N/A	N/A	**N/A**
Manganese	N/A	0.003	0.001	**0.004**	N/A	N/A	N/A	**N/A**
Mercury	0.006	0.01	0.001	**0.01**	N/A	N/A	N/A	**N/A**
Thallium	N/A	0.003	0.0004	**0.004**	N/A	N/A	N/A	**N/A**
Zinc	N/A	0.0003	0.0001	**0.0004**	N/A	N/A	N/A	**N/A**
Totals	**0.006**	**0.05**	**0.05**	**0.1**	**N/A**	**4.5E-07**	**1.4E-07**	**5.9E-07**

Media: Sediment

	Current/Future Other Recreational Person Adult								Current/Future Other Recreational Person Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Arsenic	N/A	0.001	0.6	**0.6**	N/A	9.9E-08	6.0E-06	**6.1E-06**	N/A	0.01	0.9	**0.9**	N/A	6.2E-07	5.6E-06	**6.2E-06**
Mercury	N/A	0.002	0.0	**0.03**	N/A	N/A	N/A	**N/A**	N/A	0.02	0.05	**0.1**	N/A	N/A	N/A	**N/A**
Totals	**N/A**	**0.003**	**0.6**	**0.6**	**N/A**	**9.9E-08**	**6.0E-06**	**6.1E-06**	**N/A**	**0.03**	**0.9**	**0.9**	**N/A**	**6.2E-07**	**5.6E-06**	**6.2E-06**

Table 5-14
Summary of Media-Specific Risks and Hazards For CT
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Surface Soil

	Future Construction Worker							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**
2-Amino-4,6-dinitrotoluene	N/A	0.004	0.002	**0.006**	--	--	--	**--**
Aluminum	N/A	0.005	0.0006	**0.005**	--	--	--	**--**
Antimony	N/A	0.002	0.0006	**0.002**	--	--	--	**--**
Arsenic	N/A	0.02	0.003	**0.02**	--	--	--	**--**
Barium	N/A	0.0006	0.00002	**0.0006**	--	--	--	**--**
Cadmium	N/A	0.0004	0.0006	**0.001**	--	--	--	**--**
Chromium	N/A	0.0007	0.02	**0.02**	--	--	--	**--**
Copper	N/A	0.0007	0.00004	**0.001**	--	--	--	**--**
Iron	N/A	0.03	0.005	**0.03**	--	--	--	**--**
Manganese	N/A	0.006	0.001	**0.007**	--	--	--	**--**
Mercury	0.02	0.01	0.0004	**0.03**	--	--	--	**--**
Thallium	N/A	0.007	0.0002	**0.007**	--	--	--	**--**
Zinc	N/A	0.0005	0.00007	**0.0006**	--	--	--	**--**
Totals	**0.02**	**0.09**	**0.03**	**0.1**	**--**	**--**	**--**	**--**

	Future Resident Adult								Future Resident Child							
	HQ				CR				HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(a)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Benzo(b)fluoranthene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Dibenz(a,h)anthracene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	**N/A**	--	--	--	**--**	N/A	N/A	N/A	**N/A**	--	--	--	**--**
2-Amino-4,6-dinitrotoluene	N/A	0.002	0.01	**0.01**	--	--	--	**--**	N/A	0.02	0.01	**0.03**	--	--	--	**--**
Aluminum	N/A	0.003	0.002	**0.004**	--	--	--	**--**	N/A	0.02	0.002	**0.03**	--	--	--	**--**
Antimony	N/A	0.001	0.002	**0.003**	--	--	--	**--**	N/A	0.008	0.002	**0.01**	--	--	--	**--**
Arsenic	N/A	0.01	0.01	**0.02**	--	--	--	**--**	N/A	0.1	0.008	**0.1**	--	--	--	**--**
Barium	N/A	0.0003	0.0001	**0.0004**	--	--	--	**--**	N/A	0.003	0.00007	**0.003**	--	--	--	**--**
Cadmium	N/A	0.0002	0.002	**0.002**	--	--	--	**--**	N/A	0.002	0.002	**0.004**	--	--	--	**--**
Chromium	N/A	0.002	0.05	**0.05**	--	--	--	**--**	N/A	0.02	0.05	**0.07**	--	--	--	**--**
Copper	N/A	0.0004	0.0001	**0.0005**	--	--	--	**--**	N/A	0.003	0.0001	**0.003**	--	--	--	**--**
Iron	N/A	0.02	0.02	**0.03**	--	--	--	**--**	N/A	0.1	0.02	**0.2**	--	--	--	**--**
Manganese	N/A	0.003	0.002	**0.005**	--	--	--	**--**	N/A	0.03	0.002	**0.03**	--	--	--	**--**
Mercury	0.06	0.006	0.001	**0.07**	--	--	--	**--**	0.2	0.06	0.001	**0.2**	--	--	--	**--**
Thallium	N/A	0.004	0.0007	**0.004**	--	--	--	**--**	N/A	0.03	0.0008	**0.04**	--	--	--	**--**
Zinc	N/A	0.0003	0.0002	**0.0005**	--	--	--	**--**	N/A	0.003	0.0002	**0.003**	--	--	--	**--**
Totals	**0.06**	**0.05**	**0.09**	**0.2**	**--**	**--**	**--**	**--**	**0.17**	**0.5**	**0.09**	**0.7**	**--**	**--**	**--**	**--**

Table 5-14
Summary of Media-Specific Risks and Hazards For CT
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Media: Surface Soil (continued)

	Future Resident Adult/Child							
	HQ				CR			
Chemical	**Inh**	**Ing**	**Der**	**Total**	**Inh**	**Ing**	**Der**	**Total**
Benzo(a)anthracene	--	--	--	**--**	N/A	7.2E-08	N/A	**7.2E-08**
Benzo(a)pyrene	--	--	--	**--**	N/A	6.8E-07	N/A	**6.8E-07**
Benzo(b)fluoranthene	--	--	--	**--**	N/A	8.9E-08	N/A	**8.9E-08**
Dibenz(a,h)anthracene	--	--	--	**--**	N/A	6.1E-07	N/A	**6.1E-07**
Indeno(1,2,3-cd)pyrene	--	--	--	**--**	N/A	3.6E-08	N/A	**3.6E-08**
2-Amino-4,6-dinitrotoluene	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Aluminum	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Antimony	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Arsenic	--	--	--	**--**	N/A	4.8E-06	7.6E-07	**5.5E-06**
Barium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Cadmium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Chromium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Copper	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Iron	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Manganese	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Mercury	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Thallium	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Zinc	--	--	--	**--**	N/A	N/A	N/A	**N/A**
Totals	**--**	**--**	**--**	**--**	**N/A**	**6.2E-06**	**7.6E-07**	**7.0E-06**

Table 5-15
Summary Table for All Pathways for All CT Exposure Scenarios
Lab Area Undergeound Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Pathways						Total Risk for Pathways	Total HI for Pathways	Percent Contribution by Pathway					
	Inhalation		Ingestion		Dermal				Inhalation		Ingestion		Dermal	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Subsurface Soil														
Future Construction Worker	--	--	--	0.1	--	0.03	**--**	**0.1**	--	--	--	75%	--	25%
Future Industrial Worker	--	--	7E-07	--	3E-07	--	**9E-07**	**--**	--	**--**	71%	--	29%	--
Future Resident Child	--	0.02	--	0.4	--	0.09	--	**0.5**	--	3%	--	81%	--	17%
Future Age-Adjusted Resident	--	--	2E-06	--	4E-07	--	**3E-06**	**--**	--	**--**	76%	--	12%	--

Risk = carcinogenic risk as determined by the risk calculations in Appendix.
HI = Hazard index as determined by the risk calculation in Appendix.

Table 5-16
Summary Table for All Pathways for All CT Exposure Scenarios
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Pathways						Total Risk for Pathways	Total HI for Pathways	Percent Contribution by Pathway					
	Inhalation		Ingestion		Dermal				Inhalation		Ingestion		Dermal	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Surface Soil														
Current/Future Industrial Worker	N/A	0.006	4.5E-07	0.05	1.4E-07	0.05	**5.9E-07**	**0.10**	--	6%	76%	46%	24%	48%
Future Construction Worker	--	0.02	--	0.09	--	0.03	**--**	**0.1**	--	12%	--	66%	--	21%
Future Resident Adult	--	0.06	--	0.05	--	0.09	**--**	**0.2**	--	31%	--	25%	--	44%
Future Resident Child	--	0.17	--	0.5	--	0.1	**--**	**0.7**	--	23%	--	64%	--	13%
Future Resident Adult/Child	N/A	--	6.2E-06	--	7.6E-07	--	**7.0E-06**	**--**	--	--	89%	--	11%	--
Sediment														
Current/Future Recreational Person Adult	N/A	N/A	9.9E-08	0.003	6.0E-06	0.6	**6.1E-06**	**0.6**	--	--	2%	0%	98%	100%
Current/Future Recreational Person Child	N/A	N/A	6.2E-07	0.03	5.6E-06	0.9	**6.2E-06**	**0.9**	**--**	--	10%	3%	90%	97%

Risk = carcinogenic risk as determined by the risk calculations in Appendix.
HI = Hazard index as determined by the risk calculation in Appendix.
N/A - not calculated.

Table 5-17
Summary Table for Risks and Hazards Across Media for CTs
Lab Area Undergeound Sewer Lines
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Scenarios				Total Risk for Pathways	Total HI for Pathways	Exposure Scenarios			
	Subsurface Soil		Sediment				Subsurface Soil		Sediment	
	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI
Future Construction Worker	--	0.1	--	--	**--**	**0.1**	--	100%	--	--
Future Industrial Worker	9E-07	--	--	--	**9E-07**	**--**	100%	--	--	--
Future Resident Child	--	0.5	--	--	**--**	**0.5**	--	100%	--	--
Future Age-Adjusted Resident	3E-06	--	--	--	**3E-06**	**--**	100%	--	--	--

Table 5-18
Summary Table for Risks and Hazards Across Media for CTs
Lab Area Surface Soil and Wetland Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

	Exposure Scenarios						Total Risk for Pathways	Total HI for Pathways	Exposure Scenarios					
	Surface Soil		Sediment		Surface Water				Surface Soil		Sediment		Surface Water	
	Risk	HI	Risk	HI	Risk	HI			% Risk	% HI	% Risk	% HI	% Risk	% HI
Current/Future Industrial Worker	6E-07	0.1	--	--	--	--	**6E-07**	**0.1**	100%	100%	--	--	--	--
Future Construction Worker	--	0.13	--	--	--	--	**--**	**0.13**	--	100%	--	--	--	--
Future Resident Adult	--	0.19	--	--	--	--	**--**	**0.19**	--	100%	--	--	--	--
Future Resident Child	--	0.7	--	--	--	--	**--**	**0.7**	--	100%	--	--	--	--
Future Resident Adult/Child	7E-06	--	--	--	--	--	**7E-06**	**--**	100%	--	--	--	--	--

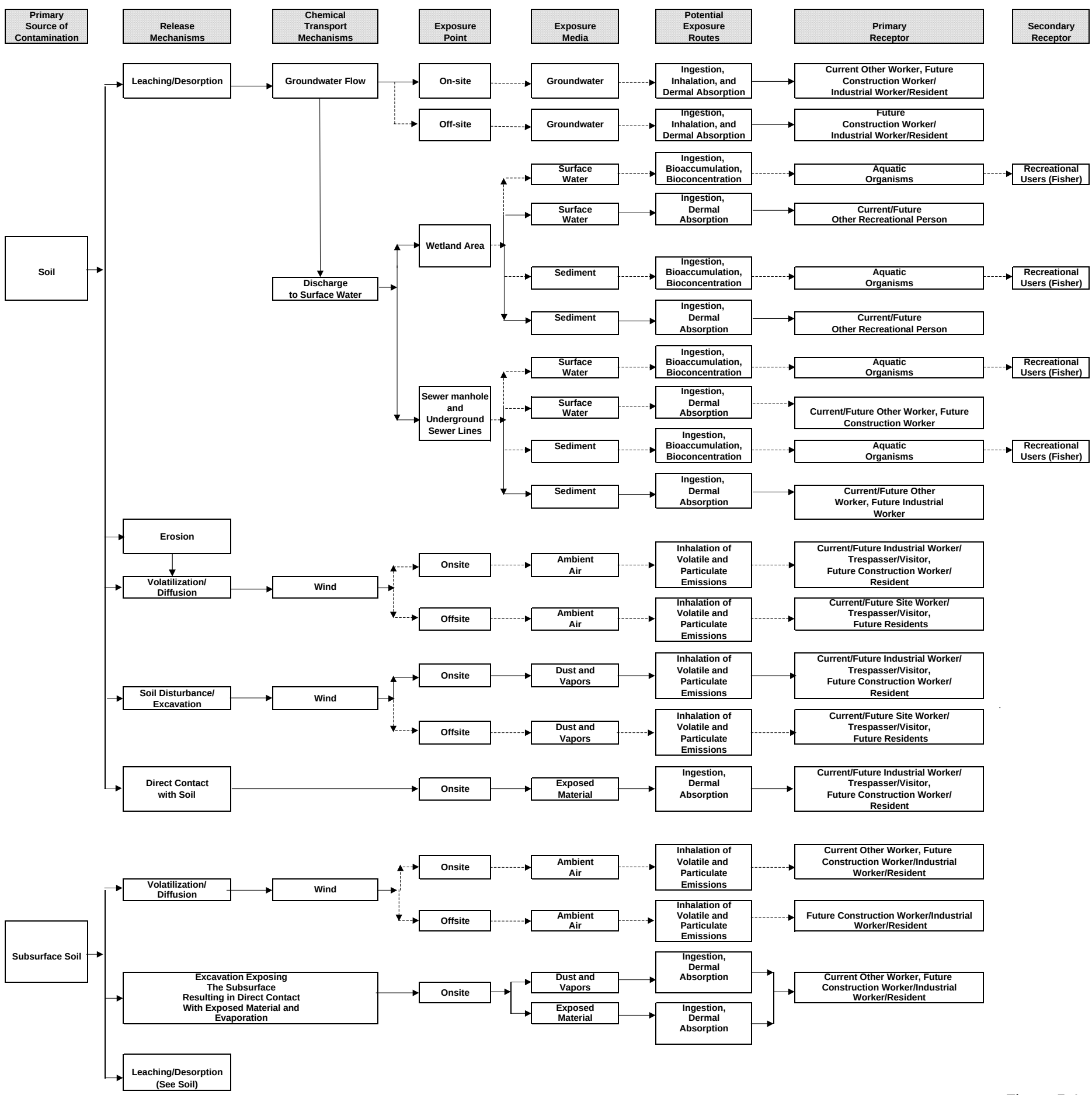

Figure 5-1
Conceptual Site Model for Potential Human Exposures
Lab Area RI
NDWIH
Indian Head, Maryland
CH2MHILL

SECTION 6

Lab Area Ecological Risk Assessment (Steps 1-3A)

6.1 Ecological Risk Assessment General Approach and Methodology

This section describes the general technical approaches, methodologies, models, and parameter values used to prepare the Screening Ecological Risk Assessment (SERA) (i.e., Steps 1 and 2) and the first step (i.e., Step 3A) of the Baseline Ecological Risk Assessment (BERA) for the Lab Area. The ERAs were conducted in general accordance with Navy (CNO, 1999; NAVFAC, 2001) and USEPA (USEPA, 1997) ERA guidance.

The Navy ERA process, which consists of eight steps organized into three tiers, is conceptually similar to the eight-step ERA process outlined in USEPA ERA guidance for the Superfund program. The major differences between the Navy ERA policy and the USEPA ERA guidance include the following:

- Navy policy provides clearly defined criteria for exiting the ERA process at specific points;
- Navy policy divides Step 3 (i.e., the first step of a baseline ERA) into two distinct sub-steps, Steps 3A and 3B, with a potential exit point after Step 3A; and
- Navy policy incorporates risk management considerations throughout all tiers of the ERA process, whereas risk management is essentially confined to Step 8 in the USEPA guidance.

The major tiers of the ERA process include:

(1) SERA (i.e., Tier 1; Steps 1 and 2);
(2) BERA (i.e., Tier 2; Steps 3-7); and
(3) Evaluation of remedial alternatives/risk management (i.e., Tier 3; Step 8).

The ERA (i.e., Tier 1 or Tiers 1 and 2, combined) provides remedial project managers the information necessary upon which to make a risk management decision that ensures protection of the environment. Steps 1, 2, and 3A are included in this document. Steps 1 and 2 are the SERA. Step 3A involves a refinement of the conservative exposure parameters used in the SERA and a recalculation of risks.

6.1.1 Problem Formulation Development

Problem formulation establishes the goals, scope, and focus of the risk assessment. Preliminary conceptual models are developed for each site to describe potential sources, transport pathways, exposure pathways and routes, and potential receptors. Assessment endpoints and measurement endpoints are selected to evaluate those receptors for which

complete and potentially significant exposure pathways are likely to exist. The fate, transport, and toxicological properties of the chemicals present at each site are also considered during this process.

Discussion of the fate and transport of chemicals provides information on how chemicals are transported from sources to receptors. Exposure routes are the specific mechanism by which a chemical contacts or enters the body of a receptor. Exposure routes can include ingestion (i.e., ingestion of water, soil, and/or sediment, or prey with chemical body burdens), inhalation, and dermal absorption. Dermal and inhalation exposures for upper trophic level receptor species are not considered significant relative to ingestion exposures because of the general fate properties (e.g., relatively high adsorption to solids) of the chemicals commonly present at these sites and the protection offered by hair or feathers.

The conclusion of the problem formulation stage includes the selection of preliminary assessment and measurement endpoints, based on the preliminary conceptual model. Endpoints in the SERA define ecological attributes that are to be protected (i.e., assessment endpoints) and measurable characteristics of those attributes (i.e., measurement endpoints) that can be used to gauge the degree of impact that has or could occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site (USEPA, 1997). Assessment endpoints contain an entity (e.g., fish-eating birds) and an attribute of that entity (e.g., survival rate).

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, receptor species (e.g., great blue heron) or species groups (e.g., fish) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (guilds, e.g., piscivorous birds) represented in the assessment endpoints (e.g., survival and reproduction of piscivorous birds).

6.1.2 Analysis

6.1.2.1 Ecological Effects Evaluation

The purpose of the effects evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. The majority of the medium-specific screening values were obtained from USEPA (1995). Replacements and additions to the USEPA (1995) set and the rationale for their selection are provided in Appendix K.

Ingestion screening values for dietary exposures were selected for chemicals analyzed for and identified as potential bioaccumulators in USEPA (2000). Toxicological information from the literature for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of non-wildlife species (e.g., laboratory mice) where necessary. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight (wet) of the receptor per day (mg/kg-BW/day).

NOAELs from chronic studies with endpoints of growth or reproduction were selected preferentially. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic LOAELs or acute values as follows:

- When values for chronic toxicity were not available, the median lethal dose (LD_{50}) was used. An uncertainty factor of 100 was used to convert the acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL).
- An uncertainty factor of 10 was used to convert a reported chronic LOAEL to a chronic NOAEL.

Ingestion screening values for mammals and birds are summarized in Tables 6-1 and 6-2, respectively.

6.1.2.2 Ecological Exposure Estimation

The assumptions, parameter values, and methods to estimate ecological exposures were as follows:

- Risk estimates were based on maximum concentrations in Step 2 (SERA) and average concentrations in Step 3A (BERA). For upper trophic level receptors, average chemical concentrations provide a more representative estimate of the likely level of chemical exposure. This is because the local population (and, in many cases, individual organisms for highly mobile species with large home ranges relative to the size of the site) would be expected to occur throughout the site (where suitable habitat is present) and, in many cases, off-site. Mean concentrations (or some other estimate of central tendency) may also be appropriate for evaluating potential risks to populations of lower trophic level terrestrial and aquatic receptors because the members of the population are expected to be found throughout the site (where suitable habitat is present), rather than concentrated in one particular area. While effects on individual organisms might be important for some receptors (e.g., rare and endangered species), population- and community-level effects are typically more relevant to ecosystems. In many cases, the average concentration is a conservative representation of the true site average because samples are generally biased toward areas of known or suspected contamination. An evaluation of the spatial distribution of COCs and the identification of areas of potentially elevated risk to direct contact receptors will be included in Step 3B, if further evaluation is warranted (i.e., a full BERA).
- BAFs and BCFs were based on, or modeled from, literature sources. Maximum and central tendency (e.g., median or mean) values were used to calculate exposures in the SERA and BERA, respectively.
- Maximum ingestion rates and minimum body weights were used in Step 2. In Step 3A, central tendency estimates for body weight and ingestion rate were used to develop exposure estimates for upper trophic level receptors. The use of central tendency exposure parameter estimates is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.
- In addition to the NOAELs, consideration is also given to risk estimates based on LOAELs.

- Chemicals that were not detected in any samples but had reporting limits which exceeded screening values were carried into Step 3A. These non-detected chemicals and chemicals that were detected but lack toxicological information are discussed in the risk calculation and uncertainty sections.

Selection Criteria for Analytical Data

Available analytical data were selected based on the following criteria:

- Data must have been validated by a qualified data validator using acceptable data validation methods. Rejected (i.e., R-qualified) values were not used. Unqualified data and data qualified as J, L, or K were treated as detected and used as reported. Data qualified as U or B were treated as non-detected.
- For surface soil, samples collected from depths of 0 to 6 inches were used since this depth range represents the most realistic potential exposures for most of the ecological receptors evaluated in terrestrial habitats.
- For sediment, samples from depths of 0 to 6 inches were used preferentially since this depth range represents the most realistic exposures for sediment-dwelling species.
- Analytical data associated with subsurface soils (collected to characterize sewer releases) were not considered in the ERA because the depths of these samples (generally 6-12 feet bgs) are below the biologically active zone (typically no more than 3 feet bgs).

Raw, validated analytical data are presented in Appendix E.

Selection of Receptors

The upper trophic level receptor species (e.g., raccoon) were selected based on the habitats and exposure media present. Life history information and exposure parameters for the receptors are summarized in the ecological exposure estimation section. Potential risks to adult amphibians (adults) and reptiles were evaluated using other fauna (birds and mammals) as surrogates, while fish and larval amphibians (tadpoles) were evaluated through a comparison with surface water and sediment screening values.

Lower trophic level receptor species were evaluated in the assessments based on those taxonomic groupings for which screening values have been developed. These groupings and screening values are used in most ERAs. As such, specific species of aquatic biota (e.g., macroinvertebrates) were not chosen as receptor species because of the limited information available for specific species and because aquatic biota are dealt with on a community level via a comparison to surface water and sediment screening values. Similarly, terrestrial plants and soil invertebrates (e.g., earthworms are the standard surrogate) were evaluated using the lower of the soil screening values developed specifically for these groups.

Exposure Estimation

Upper trophic level receptor exposures to chemicals present in surface soil, sediment, and surface water were determined by estimating the concentration of each chemical in each relevant dietary component. Incidental ingestion of soil or sediment was included when calculating the total exposure. Exposure via drinking water was included in the food chain

modeling. Not all chemicals were evaluated for food chain exposures. Only chemicals analyzed for and identified as potential bioaccumulators in USEPA (2000) were evaluated.

Dietary items for which tissue concentrations were modeled included terrestrial plants, soil invertebrates (earthworms), small mammals, aquatic plants, aquatic invertebrates, and fish/frogs. The methodologies used for these tissue calculations are outlined in the following section. The uptake of chemicals from the abiotic media into these food items was based (where available) on maximum (for SERA) and central tendency estimates (e.g., mean or median) (for BERA) of BCFs or BAFs from the literature. Default factors of 1.0 were used only when data were unavailable for a chemical in the literature. If measured tissue values were available, they were used in place of modeled estimates.

Exposure Point Concentrations

Maximum concentrations (in Step 2) and averages (in Step 3A) were used as exposure point concentrations for exposure estimation and food chain modeling. Exposure point concentrations for terrestrial and aquatic prey items (plants, soil invertebrates, small mammals, aquatic invertebrates, and frogs) were estimated using bioaccumulation models and measured surface soil or sediment concentrations. The methodology and models used to derive these estimates are described below.

Terrestrial Plants: Tissue concentrations in the above-ground vegetative portion of terrestrial plants were estimated by multiplying the surface soil concentration for each chemical by chemical-specific soil-to-plant BCFs obtained from the literature. The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants [i.e., 15 percent (0.15); Sample et al., 1997].

For inorganic chemicals without literature-based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature-based BCFs, soil-to-plant BCFs were estimated using the algorithm provided in Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where: B_v = Soil-to-plant BCF (unitless; dry weight basis)
K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from USEPA (1995 and 1996) and are listed in Table 6-3. The maximum and central tendency soil-to-plant BCFs used in this ERA are shown in Tables 6-4 and 6-5, respectively.

Earthworms: Tissue concentrations in soil invertebrates (e.g., earthworms) were estimated by multiplying the surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature. BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (or in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and are used in the food chain

models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) are given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food chain model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms [i.e., 16 percent (0.16); USEPA, 1993]. For chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed. The soil-to-earthworm BCFs/BAFs used in this ERA are shown in Tables 6-4 and 6-5.

Small Mammals: Whole-body tissue concentrations in small mammals (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BAFs, the small mammal tissue concentration was obtained by multiplying the surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BAF obtained from the literature. The BAF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for small mammals [i.e., 32 percent (0.32); USEPA, 1993]. BAFs for shrews, voles, and mice are those reported in Sample et al. (1998b) for insectivores (or for general small mammals if insectivore values were unavailable), for herbivores, and for omnivores, respectively. The soil-to-small mammal BAFs used in this ERA are shown in Table 6-6 and 6-7.

For chemicals without soil-to-small mammal BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for these small mammal species is via the diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet; that is, a diet to whole-body BAF (wet-weight basis) of one was assumed. The use of a diet to whole-body BAF of one is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food chains (e.g., PAHs). For chemicals that are known to biomagnify (e.g., PCBs), a diet to whole-body BAF value of one will likely result in a realistic estimate of tissue concentrations based on reported literature values. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs, based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane (DDT) of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin were only 1.4 for the deer mouse (USEPA, 1990). Resulting tissue concentrations (wet-weight) were then converted to dry weight using an estimated solids content of 32 percent (see above).

Aquatic Plants: Tissue concentrations in the above-ground vegetative portion of aquatic plants were estimated using the same methodologies as described above for terrestrial plants except that sediment (not soil) concentrations were used in the calculation. The sediment-to-plant BCFs used in the ERA are shown in Tables 6-8 and 6-9.

Aquatic Invertebrates: Tissue concentrations in aquatic invertebrates were estimated by multiplying the measured sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BAFs obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight invertebrate tissue. BAFs based on depurated analyses (i.e., sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses when selecting BAF values, since direct ingestion of sediment is accounted for separately in the food chain model.

Literature values based on the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for aquatic invertebrates [i.e., 21 percent (0.21); USEPA, 1993]. For chemicals without literature based sediment-to-invertebrate BAFs, a BAF of 1.0 was assumed. The sediment-to-invertebrate BAFs used in the ERA are shown in Tables 6-10 and 6-11.

Frogs: Tissue concentrations in whole-body frogs were estimated by multiplying the sediment concentration for each chemical by chemical-specific sediment-to-fish BAFs (extrapolated to frogs) obtained from the literature. The BAF values used were based on the ratio between dry-weight sediment and dry-weight fish tissue. Literature values based on the ratio between dry-weight sediment and wet-weight fish tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for fish [25 percent (0.25); USEPA, 1993]. For chemicals without literature based sediment-to-fish BAFs, a BAF of 1.0 was assumed. The sediment-to-frog BAFs used in the ERA are shown in Tables 6-8 and 6-9.

Dietary Intakes

Dietary intakes for each receptor species were calculated using the following formula [modified from USEPA (1993)]:

$$DI_x = \frac{[[\sum_i (FIR)(FC_{xi})(PDF_i)] + [(FIR)(SC_x)(PDS)] + [(WIR)(WC_x)]]}{BW}$$

where:
- DI_x = Dietary intake for chemical x (mg chemical/kg body weight/day)
- FIR = Food ingestion rate (kg/day, dry-weight)
- FC_{xi} = Concentration of chemical x in food item i (mg/kg, dry weight)
- PDF_i = Proportion of diet composed of food item i (dry weight basis)
- SC_x = Concentration of chemical x in soil/sediment (mg/kg, dry weight)
- PDS = Proportion of diet composed of soil/sediment (dry weight basis)
- WIR = Water ingestion rate (L/day)
- WC_x = Concentration of chemical x in water (mg/L)
- BW = Body weight (kg, wet weight)

6.1.3 Screening-Level Risk Calculation

In the screening-level risk calculation (Step 2), HQs are calculated by dividing the maximum chemical concentration in the medium being evaluated by the corresponding medium-specific screening value, or by dividing the maximum exposure dose by the corresponding

ingestion screening value (i.e., NOAEL). Chemicals with HQs greater than or equal to 1.0 are considered COPCs.

COPCs also include chemicals which were not detected but had maximum detection limits in excess of screening values. Detected chemicals that could not be evaluated due to lack of a medium-specific screening value or appropriate NOAEL were also selected as COPCs. If any COPCs are identified following Step 2, the risk assessment process continues into Step 3A.

6.1.4 Refinement of Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. As discussed previously, Step 3A modifications include the use of central tendency estimates for media concentrations and exposure parameters. Risk is again characterized and uncertainties associated with the conclusions are described. If re-evaluation of the conservative exposure assumptions supports an acceptable risk determination, then the site may exit the ERA process following Step 3A (CNO, 1999).

The list of COPCs is refined in Step 3, and contaminants of concern (COCs) are selected. The selection process involves consideration of the HQs based on refined exposure assumptions (for food chain modeling, both LOAEL and NOAEL based HQs are considered), patterns in and frequency of detection, consideration of likely risk from detected chemicals without screening values, consideration of background and upgradient concentrations, consideration of potential bioavailability, and consideration of the basis (or applicability) of the direct contact and ingestion-based screening values compared to site conditions. If COPCs are identified at the end of Step 3A, the risk assessment process continues to Step 3B (revised problem formulation) and Step 4 (baseline ecological risk assessment work plan) assuming that this is not precluded by any risk management decisions made by IHIRT.

Uncertainties are also discussed as part of the ERA. Uncertainties are present in all risk assessments because of the limitations of available data and the need to make certain assumptions and extrapolations based on incomplete information. The general uncertainties associated with the assessments are discussed below:

- **Detection Limits**: Detection limits for some chemicals exceed applicable screening values in some media. When this occurs for chemicals that were not detected in any site samples, the chemical is generally not selected as a COPC because it is highly unlikely that the chemical is present at environmentally significant levels. This introduces some uncertainty in the risk assessment.

- **Ingestion Screening Values:** Data on the toxicity of many chemicals to the receptor species were sparse or lacking, requiring the extrapolation of data from other wildlife species or from laboratory studies with non-wildlife species. This is a typical limitation and extrapolation for ERAs because so few wildlife species have been tested directly for most chemicals. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors considered in selecting a surrogate species to represent another receptor species or group of species were taxonomic relatedness, trophic level, foraging method, and similarity of diet.

- A second uncertainty related to the derivation of ingestion screening values applies to metals. Most of the toxicological studies on which the ingestion screening values for metals were based used forms of the metal (such as salts) that have high water solubility and high bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based on measured total metal, regardless of form, and highly bioavailable forms are expected to compose only a fraction of the total metal concentration, this is likely to result in an overestimation of potential risks for these chemicals.
- A third source of uncertainty associated with the derivation of ingestion screening values concerns the use of uncertainty factors. For example, NOAELs were extrapolated to LOAELs using an uncertainty factor of 10. This approach is likely to be conservative since Dourson and Stara (1983) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of 5 or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

- **Chemical Mixtures**: Information on the ecotoxicological effects of chemical interactions is generally lacking. This could result in an underestimation of risk (if there are additive or synergistic effects among chemicals) or an overestimation of risks (if there are antagonistic effects among chemicals).
- **Receptor Species Selection:** Reptiles and amphibians were evaluated for risk using other fauna as surrogates. This represents an uncertainty in the risk assessment. In addition, there is some uncertainty associated with the use of specific receptor species to represent larger groups of organisms (e.g., guilds).
- **Food Chain Exposure Modeling:** Chemical concentrations in terrestrial and aquatic food items (e.g., plants, earthworms, and fish) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived exposure models and BAFs introduced some uncertainty into the resulting estimates; however, the values selected and methodology employed were intended to provide a conservative (Step 2) or more realistic (Step 3A) estimate of potential food chain exposure concentrations.
- Another source of uncertainty is the use of default assumptions for exposure parameters such as BCFs and BAFs; although, BCFs and/or BAFs for many bioaccumulative chemicals were readily available from the literature, and were used in the BERA. In addition, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor prey items is a source of uncertainty.

Specific uncertainties associated with the Lab Area ERA are discussed in Section 6.5.

6.2 Screening Problem Formulation

Problem formulation involves preparing descriptions of the environmental setting, sources, fate and transport of site chemicals, chemical ecotoxicity, and potential receptors. This

information is used to build the conceptual model. The conceptual model includes a discussion of exposure pathways, as well as assessment and measurement endpoints.

6.2.1 Site History

The Lab Area consists of various office buildings, current and former laboratories, storage magazines, and other buildings and structures (refer to Section 1.4). Most of the structures in the Lab Area were used as laboratories or for chemical storage at one time or another in their history (refer to Section 1.4). According to historical practices, there are many possible COPCs, namely mercury (refer to Section 1.4).

6.2.2 Environmental Setting

The Lab Area covers about 14 acres. The majority of the area is maintained, containing grass and trees (oaks are common). A small emergent wetland (<0.5 acres) with cattails, rushes, and several trees receives runoff from the Lab Area, blow-off water from the steam system, and possible recharge from a broken freshwater line that runs beneath the northern edge of the wetland (near the sewer line from I568 Valve Vault and Manhole 471A). Wetland hydrology is provide by surface runoff, blow-off water from the steam system, and until it was repaired in November 2001, the aforementioned leak. It is estimated that between 30 and 50 gallons per minute were being released from the water line (Shawn Jorgensen and Heidi Morgan, NDWIH Environmental). Groundwater does not discharge into the wetland. Groundwater at the site is more than 40 feet below surface (E/A& H, 1994).

The wetland is bisected northeast to southwest by a small channel and northwest to southeast by a walkway. A culvert carries water under the walkway. The channel, which originates in the wetland, is the only area of the wetland with significant standing water. During a September 23, 1999, site visit by a CH2M HILL ecologist, most of the channel was 1 to 2 feet wide with a few inches of water. The channel is widest (i.e., 3 feet to 4 feet) and deepest (i.e., 4 inches to 5 inches) near the culvert. In some locations, the channel banks flatten out and the water moves through multiple secondary channels. Water was not flowing in the channel during the site visit.

The channel supports insects, other invertebrates, and amphibian larvae, but not fish. Adult frogs were observed during the site visit. Overflow from the wetland area drains into the storm drain system. The storm drain outlets to Mattawoman Creek near IR Sites 39 and 41. At the northern end of the wetland, there are sloped areas vegetated with grass that are mowed on an infrequent basis.

6.2.3 Summary of Available Analytical Data

A total of 80 surface soil samples, IS49SS01, IS49SS02, and IS53SS01 through IS53SS78, were collected as part of the RI (refer to Sections 2.1.2 and 2.1.5). Two of the samples, IS53SS77 and IS53SS78, were collected southeast of the wetland area and near Buildings 109 and 109a, for the purpose of comparing the site area samples to relatively uncontaminated samples, and were not used to determine site maximum and mean concentrations.

Additionally, six sediment samples (IS53SD14 through IS53SD19) were collected in the wetland of the Lab Area (refer to Sections 2.1.2 and 2.1.4.2); however, because the habitat at

four of the locations was not true aquatic habitat, samples IS53SD16 through IS53SD19 were classified as surface soil samples, despite their sample identification designation as sediment samples. Samples IS53SD14 and IS53SD15 were collected in the channel, and thus, were classified as sediment.

One surface water sample, IS53SW01, was taken from the channel in the emergent wetland of the Lab Area (refer to Section 2.1.4.1).

Note that due to a database error, surface soil sample IS53SS59 was not included in the risk calculations for the ERA. With the exception of lead (22.2 mg/kg) and zinc (40.3 mg/kg), concentrations in this sample were at or less than the 95-percent upper confidence limit for base-wide background. The exclusion of this sample did not alter the outcome of the assessment. Lead and zinc were selected as COCs in surface soil (refer to Section 6.5.3.3).

6.2.4 Ecotoxicity and Potential Receptors

As mentioned above, the primary contaminant at the Lab Area was anticipated to be mercury. Mercury occurs in the environment in several forms: elemental mercury [Hg_2(II)], a naturally oxidized form of elemental mercury [Hg(II)], inorganic compounds or salts, and organic methylmercury (MeHg) (Eisler, 1987; and ATSDR, 1999). Mercury is one of the most toxic contaminants, as it does not break down and is bioaccumulative. Mercury (II) is usually unavailable to aquatic systems and bound up in sediments. However, microbial activity can transform mercury (II) into organic methylmercury, which can be taken up by organisms and is the most readily assimilated form. Biota bioconcentrate methylmercury compounds, which can be further biomagnified through food chains.

Numerous studies have shown the negative effects of mercury exposure on the growth, survival, and reproduction of organisms in soil, water, and sediments. Exposure of barley seedlings to 64 mg/kg of mercury for 7 days resulted in a 16 percent reduction in seedling height, while 103 mg/kg reduced germination by 20 percent (Panda et al. 1992).

Survival and cocoon production in the earthworm, *Octochaetus pattoni*, were reduced by 65 percent and 40 percent, respectively, following exposure to 0.5 mg/kg mercury (Abbasi and Soni, 1983); however, exposure did not affect the number of juveniles produced. Studies have shown the effect of methylmercury on survivorship and segment regeneration in the earthworm, *Eisenia fetida*, in which a concentration of 12.5 mg/kg mercury reduced survival by 21 percent, and the ability to regenerate excised segments was reduced by 69 percent (Beyer et al., 1985).

Twenty-four hours of exposure to 300 µg/L mercury (II) (as $HgCl_2$) resulted in nearly 100 percent mortality, deformities, and reduced growth for the ornate rice frog, *Mirohyla ornata*, embryo (Ghate and Mulherker, 1980). Similar reproductive and growth effects have been observed in other mercury-exposed frog species (Punzo, 1993; and Birge and Just, 1975).

Many more studies have demonstrated the effects of mercury on avian and mammalian species. Mallard ducks exhibited a decrease in the production of eggs and ducklings when they were given a dose of 0.5 mg/kg methylmercury dicyanidamide over the course of 3 generations (Heinz, 1979). Decreased fertility and egg hatchability were observed in Japanese quail at the dose of 8 mg/kg mercury as $HgCl_2$ (Hill and Schaffner, 1976).

Mink exposed to 10 mg/kg mercury (as $HgCl_2$) in their diets for 6 months experienced a reduction in kit weight by 9 percent (Aulerich et al., 1974). In another study, mink were fed different concentrations of mercury over the course of 93 days: Exposure to 1.8 mg/kg mercury resulted in mortality, weight loss, and behavioral abnormalities (Wobeser et al., 1976). Rats exposed to dietary methylmercury (as CH_3HgCl_2) over the course of three generations displayed a reduction in pup viability at 2.5 mg/kg (Verschuuren et al., 1976).

Receptors potentially exposed to soil chemicals at the Lab Area include organisms that have significant direct contact with soil or consume prey that live in the soil or leaf litter. At the Lab Area, these could include plants, soil invertebrates, and birds or mammals that consume plants and invertebrates. With biomagnifying chemicals present, top consumers such as raptors or foxes could also be exposed to potentially significant levels of chemicals in their diet.

For chemicals present in the channel, potential aquatic receptors include aquatic plants, benthic invertebrates, and larval amphibians. With biomagnifying chemicals present, organisms that feed in these areas may also be potential receptors (e.g., raccoon).

6.2.5 Preliminary Conceptual Model

Information on the habitat features and the fate and transport of the chemicals detected at the site were used to build the preliminary conceptual model (refer to Figure 6-1). The conceptual model addresses complete exposure pathways, receptors, and endpoints.

6.2.5.1 Exposure Pathways

An exposure pathway links a source of contamination with one or more receptors through exposure via one or more media and exposure route. For the Lab Area, the source of contamination is historic disposal of laboratory waste near the laboratory buildings. Once released, contaminants could be transported via runoff to other areas of the site or to the emergent wetland, which is situated downgradient of the laboratory buildings. Contaminants may have been transported to the wetland via leaks in the storm water and/or sewer system. There is the potential that mercury in and/or around a broken sewer pipe (line from Valve Vault I568 to Manhole 471A) may have been extracted in the dissolved phase near the surface of the emergent wetland area, due to the freshwater leak(s) in the subsurface near the sewer, and may have been pushed to the wetland surface due to the pressure associated with a leak in the water system in the area. . There is also the potential that mercury was historically and possibly is currently being transported through the storm water system to Mattawoman Creek.

Receptors may include terrestrial species that have contact with the soil (e.g., plants, soil invertebrates, American robin, and white-footed mouse) or consume organisms that have direct contact with the soil (e.g., red fox and red-tailed hawk), semi-aquatic species that forage in upland and wetland areas (e.g., raccoon), and aquatic/wetland species (e.g., plants, frogs, and benthic invertebrates) present in the wetland. The top soil over the wetland and surrounding area is relatively shallow, with an organically rich layer varying from 4 to 10 inches, overlaying a gray clay layer. Therefore, the mostly likely exposure pathway for ecological receptors is limited to the top soil layer.

Groundwater discharge into the wetland is not likely to be an important transport pathway. Depth to groundwater is greater than 40 feet (E/A&H, 1994). Because it is so deep, and because of the clay soil type and high organic carbon content (see Section 4.1.2.1), it is also unlikely that contaminants would leach to the water table. Contaminants disposed of on-site could also have historically entered the storm drain system via the culvert at the downgradient end of the wetland. From that point, they could have eventually reached Mattawoman Creek. Risks to ecological receptors in the creek are currently being addressed under the Mattawoman Creek Study by TTNUS.

6.2.5.2 Assessment and Measurement Endpoints

The conclusion of the problem formulation includes the selection of assessment and measurement endpoints. Based on the habitat and types of chemicals present, nine assessment endpoints were chosen to evaluate the potential risk to ecological receptor populations at the Lab Area. Each assessment endpoint and corresponding representative species or community is described in Table 6-12.

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected for food chain modeling since information on the toxicological effects of chemicals on adult amphibians and reptiles via ingestion is limited. Risk through the food chain is indirectly evaluated because there are receptors included in the assessment that have similar diets to reptiles and amphibians. Comparison of surface water contaminant concentrations to surface water screening values provides information about the potential for site contaminants to impact amphibian larval stages.

6.3 Screening-Level Analysis

The selection of ecological effect levels and the calculation of exposures was conducted as described in Section 6.1.

The measured hardness of the Lab Area surface water was 11 milligrams of calcium carbonate per liter (mg $CaCO_3$/l); however, for direct exposure, the surface water screening values for the hardness-dependant inorganics (e.g., cadmium, chromium, copper, lead, nickel, silver and zinc) were adjusted to the minimum default hardness of 25 mg/L (USEPA, 1996). Total metal concentrations measured in the field were compared to water quality criteria for total metals.

For food chain exposures, the exposure parameters (i.e., ingestion rates and dietary composition) for each receptor species are presented in Table 6-13. Note that the diet of the American robin is for a seven-day-old hatchling, instead of an adult. The diet of the hatchling includes earthworms and soil, but no plant material.

6.4 Screening-Level Risk Calculation

The SERA indicated that inorganics, SVOCs and some explosives in surface soil may impact the growth, survival, and/or reproduction of soil invertebrates and plants (refer to Table 6-14). These chemicals were selected as COPCs. No screening value was available for approximately one-third of the organic COPCs. Therefore, these COPCs were carried

forward into Step 3A of the ERA process. In addition, there were several undetected organic chemicals that had maximum detection limits in excess of screening values.

For surface water, several inorganics and SVOCs were identified as COPCs; however, none of the SVOCs were detected. COPCs in surface water may pose potential risks to water column receptors (refer to Table 6-15).

VOCs, SVOCs, and inorganics were identified as COPCs in sediments (refer to Table 6-16). All organic chemicals identified as sediment COPCs were below CRDLs and MDLs that were in excess of screening values.

The results of food chain modeling for the Lab Area showed that several inorganics had HQs in excess of one, and at least one or more of these inorganic chemicals may pose potential risks to every receptor species evaluated (refer to Table 6-17).

Because there were maximum chemical concentrations that exceeded screening values in surface water, soil, and sediment, and food chain modeling indicated potential risks to every receptor species, the risk assessment process was continued to Step 3A. Chemicals not posing a risk to aquatic receptors, soil invertebrates, and sediment invertebrates were not carried to Step 3A. For upper trophic receptors (i.e., food chain receptors), risks from all chemicals were recalculated in Step 3A using refined exposure assumptions.

6.5 Refinement of Conservative Exposure Assumptions (Step 3A)

In Step 3A, exposure assumptions are refined and risk estimates (i.e., HQs) are recalculated. Risk is again characterized and uncertainties associated with the conclusions are described.

6.5.1 Exposure Assumption Refinements

The results of Steps 1 and 2 (i.e., the SERA) indicated that, based on a set of conservative assumptions, there are multiple chemicals that may pose a risk to several receptor communities/species used in the screening assessment. The set of COPCs includes chemicals with HQs in excess of one, regardless of whether or not the chemical was detected, and detected chemicals for which assessment data were unavailable.

Assumptions and methods that were modified for the calculation of medium-specific and food chain hazard quotients are listed below, along with justification for each modification:

- Maximum chemical concentrations were replaced by average chemical concentrations. For individual mammalian and avian receptors, average chemical concentrations provide a better estimate of the likely level of chemical exposure because each of the receptors would be expected to forage in several different areas of the site, and, in many cases, off-site. With adequate spatial coverage, central tendency measures are also appropriate for evaluating impacts to populations of soil invertebrates and plants. While locations of maximum concentration may be important to individuals, the average value at the site can be more instructive with regard to the level of impact that might be expected at the population level.

- Central tendency estimates for body weight and ingestion rate were used to develop exposure estimates, rather than minimum body weights and maximum ingestion rates. The use of central tendency parameters is more relevant because they represent the characteristics of a greater proportion of the individuals in the population.

Refined exposure parameters for upper trophic level receptors are presented in Table 6-18.

6.5.2 Refined Risk Calculations

For soil invertebrates and plants, the mean concentrations of nine inorganics (i.e., aluminum, chromium, copper, cyanide, iron, lead, mercury, vanadium, and zinc) exceeded soil screening values (refer to Table 6-19), with HQs ranging from 2.5 to 531. The mean concentration of thirteen SVOCs (that were PAHs) detected in soil also exceeded screening values. Nine additional SVOCs were detected, but had no screening values. Five other SVOCs were not detected but had detection-limit-based averages in excess of screening values (refer to Section 6.5.4). In addition, four explosive chemicals (i.e.; 2,4-dinitrotoluene; 2-amino-4,6-dinitrotoluene; HMX; and NC) were detected but had no available screening values.

In surface water, seven detected inorganics (i.e., aluminum, copper, cyanide, iron, lead, manganese and mercury) had HQs over 1, ranging from 1.2 to 10.8 (refer to Table 6-20). Silver also had a HQ over one, based on the CRDL, but was not detected. All eight of the SVOCs with HQs in excess of 1, based on the CRDL, were not detected.

In sediment, the mean concentrations of five detected inorganics (i.e., arsenic, lead, manganese, mercury, and silver) were greater than screening values (refer to Table 6-21), with HQs ranging from 1.2 to 144. Beryllium was detected, but had no screening value. An additional twenty SVOCs had detection-limit-based HQs in excess of 1.

Inorganics were the only chemical group with food chain HQs greater than 1 (refer to Table 6-22). Levels of mercury resulted in NOAEL-based HQs greater than 1 for four receptor species (i.e., white-footed mouse, raccoon, red fox, and American robin). The NOAEL-based HQs for cadmium, chromium, lead, and zinc also exceeded 1 for the American robin. Mercury exposure estimates also resulted in LOAEL-based HQs greater than 1 for white-footed mouse (HQ = 6.0), raccoon (HQ = 1.3) and American robin (HQ = 15.6). In addition, LOAEL-based HQs were greater than 1 for the American robin exposure to lead (HQ = 6.8) and zinc (HQ = 1.9). Explosives were not evaluated in the food chain modeling because they are not included in the list of bioaccumulative chemicals published in USEPA, 2000.

6.5.3 Risk Characterization

6.5.3.1 Inorganics

Soil

The mean soil concentrations of aluminum, chromium, copper, cyanide, iron, lead, mercury, vanadium, and zinc at the Lab Area exceeded soil screening values. Of these, aluminum, cyanide, iron, and vanadium were present at concentrations consistent with NDWIH background levels (TTNUS, 2002), as demonstrated below:

Inorganic	Surface Soil Lab Area Sample Mean Concentration (mg/kg) (n = 81)*	Surface Soil Background Mean Concentration (mg/kg) (n = 10 to 34)***	Ratio
Aluminum	5,515	7540	0.7
Chromium	18.9	13.6	1.4
Copper	126	6.5	19.4
Cyanide	0.32	0.42	0.8
Iron	11,304	13,000	0.9
Lead	999	17.9	55.8
Mercury	53.1 (n = 80)**	0.05	1,062
Vanadium	23.0	23.3	0.99
Zinc	445.8	20.2	18.1

*n = 81 since surface soil sample IS53SS59 was not included in ERA calculations.

**n = 80 for mercury since surface soil sample IS53SS59 was not included in the ERA calculations and the mercury result for surface soil sample IS53SS42 was rejected.

***n varies from 10 to 34 depending on the metal; values from 2002 background study (TTNUS, 2002).

While the mean concentration of chromium in Lab Area surface soil is similar to mean NDWIH background levels, it is slightly elevated; however, it does fall within the NDWIH background concentration range of 3.5 mg/kg to 28.9 mg/kg. Furthermore, general background levels (i.e., world-wide) from the literature suggest soil-associated chromium typically exists in a range of 5 mg/kg to 250 mg/kg (Eisler, 1986), with a mean concentration reaching 37 mg/kg (NOAA, 1999), and from 15 mg/kg to 100 mg/kg in Maryland (Dragun, 1991, as cited in TTNUS, 2002). The chromium levels at the Lab Area are also within this Eisler (1986) range, and well below the NOAA (1999) mean background levels. While the benchmark used for screening chromium is much lower than site levels at 0.4 mg/kg, it is based on limited earthworm studies that incorporate chromium in its more bioavailable and soluble salt form [e.g., $K_2Cr_2O_7$ and $KCr(SO_4)_2$; Efroymson et al., 1997b]. In the environment, chromium in soil is typically found in an unavailable form (Eisler, 1986). Therefore, it is expected that chromium poses minimal risks to soil invertebrates and terrestrial plants at the Lab Area.

Copper, lead, mercury, and zinc were detected in greater than, or equal to, 95 percent of the soil samples collected at the Lab Area (n = 80 or 81). Mercury was ubiquitous in Lab Area soils and its concentration was above 100 mg/kg in 12 percent of the surface soil samples. Mercury levels in excess of 100 mg/kg were detected in soils surrounding Building 103 (111 mg/kg to 637 mg/kg) and south of Building 102 (117 mg/kg). Buildings 102 and 103 are directly upgradient of the wetland area. A soil sample southwest of the wetlands and adjacent to a Building 444 yielded 358 mg/kg. Two samples taken south of and adjacent to Building 600 yielded mercury concentrations of 120 mg/kg and 577 mg/kg, respectively. A mercury concentration of 962 mg/kg was measured in wetland area soils adjacent to the channel (in dry sediment sample IS53SD18).

The mean concentration of copper, lead, mercury, and zinc exceeded soil screening values and were relatively ubiquitous at this site (i.e., each detected in greater than, or equal to, 95 percent of all soil samples). Copper, lead, mercury, and zinc are substantially higher than facility and general environmental background levels. Therefore, these four inorganics may pose a risk to soil invertebrates and terrestrial plants and are retained as COCs for further evaluation.

Surface Water

Seven inorganic constituents (i.e., aluminum, copper, cyanide, iron, lead, manganese, and mercury) exceeded screening values in the one Lab Area surface water sample (i.e., IS53SW01). Since the surface water at this site was very shallow (i.e., 4 inches to 5 inches deep), and inorganic levels were not filtered, it is likely that particulate-bound metals were also measured in this sample, biasing the concentration high; however, the seven inorganics were retained as COCs. Collection of dissolved metals data would enable additional risk evaluation.

Sediment

Five inorganic constituents (i.e., arsenic, lead, manganese, mercury, and silver) exceeded screening values in sediment. Beryllium was also detected in sediment, but no screening value was available for comparison. The concentrations of these constituents were also greater than the sediment background concentrations. These inorganic analytes are retained as COCs. Inorganic contamination is widespread in soils. Soils near the laboratory buildings north of the emergent wetland are assumed the primary source of inorganic contamination. There is also the potential that contaminants could have been transported into the wetland by a leaking storm water system.

Food Chain

As presented in the table below, food chain exposure levels of mercury, lead, and zinc exceeded LOAEL-based screening values (i.e., HQ greater than 1).

	LOAEL-HQ		
Ecological Receptor (Surrogate Species)	**Lead**	**Mercury**	**Zinc**
Mammalian terrestrial omnivore (white-footed mouse)	-	6.0	-
Mammalian wetland omnivore (raccoon)	-	1.3	-
Avian terrestrial omnivore (American robin)	6.8	15.6	1.9

The three inorganics were retained as COCs.

6.5.3.2 Organics

There were several organics that were detected for which there were no screening values. Each is discussed below. A discussion of total PAHs concentrations by sample and how they correspond to a total PAH screening value is also provided.

Soil

1,1-Biphenyl, which did not have a screening value, was detected in 1 out of 20 soil samples at a concentration of 58 µg/kg. This level of biphenyl is lower than the soil screening value of 60 mg/kg for terrestrial plants (Efroymson et al., 1997a). In addition, the available screening values for all of the other phenolic compounds analyzed for in Lab Area soils were greater than or equal to 100 µg/kg. Biphenyl is expected to pose minimal risk to soil invertebrates and terrestrial plants since the level of biphenyl is approximately one-half the lowest phenolic screening value, the concentration does not exceed a terrestrial plant benchmark, the compound exhibited a low frequency of detection (i.e., detected in 1 out of 20 samples, or 5 percent), and it is expected to readily volatilize from surface soils.

Benzaldehyde was detected in 3 of 20 surface soil samples at a sample mean concentration of 0.2 mg/kg. Even though there was no soil screening value for benzaldehyde, toxicity studies from the literature suggest these levels may be too low to elicit significant effects to soil-associated biota. For example, the effective concentration that would affect 50 percent of the organisms, or the EC_{50}, for lettuce seed, *Lactuca sativa*, germination was 448 mg/kg following 14 days of exposure (Hulzebos et al., 1989). Furthermore, a 14-day no effect concentration (NOEC) of 100 mg/kg has also been reported for *L. sativa* (Adema and Henzen, 2001). Based on these results and its infrequency of detection, benzaldehyde levels in the Lab Area surface soil are expected to pose minimal risk to soil-associated biota.

Although there were no screening values for bis(2-ethylhexyl)phthalate, butylbenzylphthalate, or di-n-octylphthalate, the total phthalate concentration in Lab Area surface soil can be evaluated by comparison to the TOC-adjusted Dutch soil quality standard screening value of 18,631 µg/kg (MHSPE, 1994) (Lab Area average TOC was approximately 6.23 percent). Summing the detection for each sample, concentrations ranged from 41 µg/kg to 26,046 µg/kg. The total detected phthalate concentrations exceeded the TOC-adjusted screening value in only one sample (IS53SS01 had an HQ of 1.4). Based on these results, phthalates in surface soil at the Lab Area are expected to pose minimal risks to soil invertebrates and terrestrial plants.

Several PAHs were detected relatively frequently in soil samples. The mean concentration of each individual PAH compound exceeded the screening value of 100 µg/kg. The screening value for each compound is a BTAG Region III value reportedly based on carcinogenic effects in mice treated with benzo(a)pyrene. Since the objective of this analysis is to evaluate potential effects to soil invertebrates (i.e., direct soil invertebrate exposure or potential exposures for upper trophic level receptors via ingestion of soil invertebrates) this screening value is not applicable to this evaluation. In addition, this screening value does not account for site-specific TOC levels and the cumulative effect PAH compounds can elicit. In many cases, calculating a total PAH measure (i.e., sum of all individual compounds) allows for a more realistic screen of potential risks.

There is no Region III BTAG screening value for total PAHs, but the TOC-adjusted Dutch soil quality standard screening value for total PAHs is 12,915 µg/kg (MHSPE, 1994). This value was compared to the sum of the detected PAHs at each Lab Area sampling station (i.e., comparison to the screening values was made within each sampling station). There were 20 sampling stations for which PAH analysis was completed at this site.

The total PAH concentrations at 17 of the 20 sampling stations (i.e., 85 percent) were less than, or equal to, 5,950 µg/kg, less than one-half the TOC-adjusted screening value. Total PAH concentrations exceed the total PAH screening value at only three sampling stations (i.e., IS53SS14, IS53SS20, and IS53SS39). The HQs for stations IS53SS14, IS53SS20, and IS53SS39 are 1.1, 6.8, and 1.1, respectively. All three of these sampling stations are situated directly adjacent to facility buildings. Station IS53SS39 is adjacent to the northern side of Building 556, IS53SS20 is adjacent to the northern side of Building 595, and IS53SS14 is adjacent to the northern side of Building 108A (refer to Figure 2-1).

The presence of PAHs at higher concentrations in these locations may be a result of isolated events (e.g., spill or dumping of waste oil) or ongoing processes (e.g., runoff from adjacent paved areas). Soils at other stations adjacent to these buildings were not analyzed for PAHs (i.e., 61 of the 81 soil samples were not analyzed for organics). Given the scattered nature of the elevated PAH concentrations at the site and the uncertainty surrounding their distribution, PAHs were retained as soil COCs.

Three other semivolatile organic chemicals, acetophenone, carbazole, and dibenzofuran, were also detected in Lab Area surface soil and were retained as COCs since there were no screening values for them. Acetophenone was detected in 4 of 20 samples at a mean concentration of 186 µg/kg, carbozole was detected in 5 of 20 samples at a mean concentration of 245 µg/kg, and dibenzofuran was detected in 2 of 20 samples at a mean concentration of 209 µg/kg. Little is known regarding the toxicity of these three SVOCs. As for the PAHs at the Lab Area, not enough data are available to clearly define the spatial distribution of these SVOCs; however, the maximum concentrations of each were measured at IS53SS14 and IS53SS20, two of the three locations where PAHs were elevated. This pattern suggests that SVOCs may be co-located. Therefore, acetophenone, carbazole, and dibenzofuran were retained as COCs.

Four explosive compounds; 2,4-dinitrotoluene; 2-amino-4,6-dinitrotoluene; HMX; and NC; were detected in Lab Area surface soil. There were no screening values for these explosive compounds. 2,4-Dinitrotoluene (2,4-DNT) was detected in 4 of 81 samples at a mean concentration of 0.34 mg/kg. 2-Amino-4,6-dinitrotoluene (2-ADNT) and HMX were each only detected in 1 of the 81 samples at concentrations of 2.1 mg/kg and 268.4 mg/kg, respectively. NC was detected in 22 of 81 surface soil samples at a mean concentration of 5 mg/kg, with a maximum concentration of 75 mg/kg.

Studies have shown that 80 mg/kg of 2-ADNT (almost 40 times higher than Lab Area surface soil) had no effect on yellow nutsedge or soil microbial processes following 42 days of exposure (Pennington, 1988). Studies with earthworms (i.e., Eisenia foetida) exposed to HMX have suggested that relatively high levels of HMX would be required to result in significant toxicological effects. Following 14 days of exposure to as much as 500 mg/kg HMX resulted in no earthworm mortality, and less than an 18 percent reduction in weight (Phillips et al., 1993); this is almost twice the concentration detected in Lab Area surface soil. Likewise, reported levels resulting in effects for soil organisms exposed to 2,4-DNT are higher than Lab Area levels (UNEP, 2001). The effective concentration that would affect 10 percent of the organisms, or the EC10, for springtail, Folsomia candida, exposed to 2,4-DNT for 33 days was 2.8 mg/kg. In addition, lettuce seeds, Lactuca sativa, exposed to 2,4-DNT for 14 days resulted in an EC50 of 4.9 mg/kg.

Based on available toxicity information and spatial distribution (i.e., frequency of detection ranges from one to five percent of the samples); 2,4-DNT; 2-ADNT; and HMX are likely to pose minimal risk to soil-associated biota and therefore will not be retained as COCs.

According to the US Army Environmental Center (AEC) (2001), NC is relatively non-toxic and readily undergoes biological degradation in soils. NC fines are typically composted in soils to render them inert. It has been shown that relatively high levels (540 mg/kg in sediment and 1000 mg/L in water) had no effect on several invertebrates, fish, and algal species (Bentley et al., 1976; and Sullivan et al., 1978). As the levels in Lab Area soils are one or more orders of magnitude lower than those shown not to adversely impact sediment invertebrates, NC is expected to pose minimal risks to soil invertebrates and plants at the Lab Area.

6.5.3.3 Summary and Distribution of COCs

The table below provides a summary of the COCs for the Lab Area by exposure route and medium. Inorganics in soil and sediment, particularly mercury, are of greatest concern at the site, posing potential risks to soil invertebrates, sediment invertebrates, and upper trophic level receptors. Inorganics in surface water were also selected as COCs. Available unfiltered data suggest that water within the channel may pose a risk to aquatic receptors (i.e., water column invertebrates and amphibians).

	Direct Exposure (by media)			
Chemical	**Soil**	**Surface Water**	**Sediment**	**Food Chain**
Inorganics				
Aluminum		X		
Arsenic			X	
Copper	X	X		
Cyanide		X		
Iron		X		
Lead	X	X	X	AM
Manganese		X	X	
Mercury	X	X	X	AM, M, R
Silver			X	
Zinc	X			AM
Organics				
Total PAHs	X			
Acetophenone	X			
Carbazole	X			
Dibenzofuran	X			

"X" denotes COC
AM = American robin, M = white-footed mouse, R = raccoon

The data, which represent the spatial distribution of the primary inorganic COCs (i.e., lead and mercury), suggest that the soil adjacent to several buildings upgradient of the wetlands is the source of the contamination (refer to Figures 3-4 and 3-5).

A broad range of mercury concentrations were measured in the Lab Area surface soil and wetland dry sediment samples (refer to Figure 3-5). Most of the highest levels (i.e., 50 mg/kg to greater than 900 mg/kg at 12 of 81 sampling stations) were measured in samples taken adjacent to Buildings 101, 102, and 103 and southeast into the wetland (e.g., 962 mg/kg at IS53SD18). There were also eight sampling stations (close to the same buildings and upgradient of the wetland) at which mercury was measured at levels between 10 mg/kg and 50 mg/kg in soil. High mercury concentrations were also measured at two sampling stations (i.e., IS53SS48 and IS53SS49) off the southern side of Building 600. Unlike the sampling stations around Buildings 101, 102, and 103, the runoff from sampling locations IS53SS48 and IS53SS49 around Building 600 is not expected to flow eastward into the wetland. The topography shown on Figure 3-5 suggests that surface runoff from the south side of Building 600 may flow west along Evans Road; although, detected mercury concentrations elsewhere in the Lab Area have a lower range of 0.3 mg/kg to 10 mg/kg, they still exceeded the soil screening value of 0.1 mg/kg (Efroymson et al., 1997b).

The two sediment samples collected from the wetland channel had mercury concentrations of 24.5 mg/kg and 18.6 mg/kg, far greater than the sediment screening value of 0.15 mg/kg. Mercury was also detected at 4.4 mg/kg in the only wetland dry sediment sample collected within the emergent wetland, to the east of the channel.

Like mercury, the highest levels of lead were measured in surface soil samples collected near facility buildings directly north and northwest of the wetland. At six stations (i.e., IS53SS01, IS53SS03, IS53SS04, IS53SS25, IS53SS26, and IS53SS57), lead concentrations ranged from approximately 2,000 mg/kg to greater than 31,000 mg/kg (refer to Figure 3-4). These high concentrations were primarily measured adjacent to Buildings 102, 103, 303, and 304. Levels of lead greater than 250 mg/kg (i.e., more than five times the screening value) were also detected near Buildings 101, 108, 108A, 502, 556, and 600, in addition to those buildings mentioned above. In total, lead levels adjacent to 10 buildings, 5 of which are directly upgradient of the wetland, exceed 250 mg/kg in Lab Area surface soil.

Lead analyses of wetland dry sediment and channel sediment suggest that lead has migrated from the facility buildings to the wetland. Two of the four wetland dry sediment samples had lead concentrations in excess of the soil screening value of 50 mg/kg (refer to Figure 3-4). One of the two sediment samples collected from the channel had a lead concentration of 82 mg/kg, exceeding the sediment screening value of 46.7 mg/kg (USEPA, 1995).

Zinc was also detected at elevated levels. The distribution of zinc was similar to that of lead and mercury. While selected as a COC, copper contamination was not as widespread or substantial as the other inorganic COCs. Levels at a small subset of sampling stations (e.g., IS53SS46 at 4,000 mg/kg and IS53SS74 at 964 mg/kg) strongly biased the mean concentration. Copper levels exceeded the soil screening value of 50 mg/kg (Efroymson et al., 1997a) at approximately 30 percent of the stations, with the exceedances occurring near the same buildings where high lead and mercury concentrations were measured.

As discussed in Section 6.5.3, the distribution of organic COCs is not clearly defined. Available data suggest that the occurrence of high levels of PAHs and other SVOCs does not follow the same pattern as has been observed for lead and mercury. The highest total PAH concentrations were detected at sampling locations on the north side of Buildings 600, 556, and 596. None of the highest mercury or lead concentrations were found on the north side of those buildings.

6.5.4 Uncertainty

Several organic constituents in soil, surface water, and sediment, as well as two inorganic constituents (i.e., silver in surface water and cyanide in sediment), had detection-limit-based mean concentrations exceeding direct exposure screening values (refer to the shaded cells in Tables 6-9, 6-20, and 6-21). Since the available data and site history suggest that organic contaminants are not the primary ecological concern at the site, these detection-limit-based exceedances of screening values are not a significant data gap.

There was also uncertainty associated with the lack of screening values for some of the undetected organic compounds. In general, the detection limits for organics without screening values were generally consistent with the detection limits for organics with screening values. Since the available data suggest that organic contaminants are not the

primary ecological concern at the site, the undetected organics, if present, are expected to pose minimal risks.

6.6 Risk Conclusion

The COCs selected after Step 3A are summarized below. Inorganics in soil and sediment (particularly mercury) are of greatest concern at the site, posing potential risks to soil invertebrates, sediment invertebrates, and upper trophic level receptors that have substantial direct contact with soils, or consume prey that have direct contact with soils. Food chain modeling also suggests that lead and zinc may pose risk through the food chain. Due to the high concentrations of mercury at the site, verification of the concentration of mercury in prey items is important for the top predators (e.g., red tailed hawk), even though food chain modeling showed minimal risk to this type of receptor.

Available data indicate that inorganic contamination, while generally highest near facility buildings upgradient of the emergent wetland, is distributed throughout much of the Lab Area. Wetland soil and stream channel samples collected downgradient of facility buildings suggest that inorganic contaminants have been transported into the emergent wetland, and potentially to Mattawoman Creek through the storm sewer system.

Although the distribution of organic COCs is not clearly defined, available data suggests that their occurrence may be a result of small, isolated releases. Relative to the inorganic contamination at the site, organic COCs are not expected to contribute significantly to ecological risk at the site.

As mentioned in Section 4.2.7, the emergent wetland is thought to be supported largely by potable water leaks. Two of these leaks were repaired since the RI field activities occurred, which may potentially reduce the size of the emergent wetlands. Regardless of the size or the presence of the emergent wetlands, risk to ecological receptors cannot be ruled out.

It is recommended that additional risk assessment work be conducted to: (1) confirm with a greater level of certainty the risk posed by COCs (i.e., what COCs in what media pose a risk to what organism); and (2) more accurately define the spatial area over which those risk are present.

COCs identified after Step 3A were as follows:

Soil Invertebrates	Benthic Invertebrates	Water Column Invertebrates and Amphibians	Insectivorous Birds	Insectivorous Mammals	Omnivorous Wetland Mammals
Copper	Arsenic	Aluminum	Lead	Mercury	Mercury
Lead	Lead	Copper	Mercury		
Mercury	Manganese	Cyanide	Zinc		
Zinc	Mercury	Iron			
Total PAHs	Silver	Lead			
Acetophenone		Manganese			
Carbazole		Mercury			
Dibenzofuran					

Since the Draft Final RI was distributed, IHIRT and BTAG agreed on a path forward for the Lab Area (during the conference call on October 23, 2003). The decision included removing the impacted media in the emergent wetland and restoring the wetland. The removal Preliminary Remediation Goals (PRGs) will be based on literature-based PRGs to be approved by BTAG via a Technical Memorandum and the removal and restoration will occur as part of the FS and/or Engineering Estimate / Cost Analysis (EE/CA) effort for the Lab Area upland surface soil (to be investigated further with the Lab Area Upland Soil BERA). Thus, potential risks to wetland receptors (i.e., water column invertebrates, amphibians, and omnivorous wetland mammals) will be removed once the wetland is restored. Therefore, further evaluation to refine the risk estimates associated with sediment COCs will not be conducted as part of the additional risk assessment work.

Further evaluation of potential ecological risk (i.e., a BERA) will be performed on the surrounding Lab Area surface soil, to (1) confirm with a greater level of certainty the risk posed by COCs, (2) more accurately define the spatial area over which those risks are present, and (3) support development of PRGs for possible subsequent soil removal if unacceptable risks are identified at the conclusion of the BERA.

6.7 References

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Table 6-1
Ingestion Screening Values for Mammals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.126	Sample et al. 1996
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10	1	Sample et al. 1996
Cadmium	dog	10	3 months	oral	reproduction	7.5	0.75	ATSDR 1993
Chromium	rat	0.35	3 months	oral in water	mortality	131.4	13.14	Sample et al. 1996
Copper	mink	1	357 days	oral in diet	reproduction	15.14	11.7	Sample et al. 1996
Lead	rat	0.35	3 generations	oral in diet	reproduction	80	8	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1	93 days	oral in diet	mortality/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80	40	Sample et al. 1996
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.2	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	mortality	181	18.1	ATSDR 1990
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1	25 weeks	oral	reproduction	208	20.8	ATSDR 1992
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	857	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	reproduction	500	250	Coulston and Kolbye 1994
2,4,5-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4,6-Trichlorophenol	rat	0.35	98 days	oral in diet	hepatic/renal	800	80	McCollister et al. 1961
2,4-Dichlorophenol	rat	0.35	103 weeks	oral in diet	reproduction	4400	440	NTP 1989
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Methylnaphthalene	mouse	0.03	81 weeks	oral in diet	systemic	1437	143.7	ATSDR 1995
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3500	350	ATSDR 1995
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	3500	350	ATSDR 1995
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	10000	1000	ATSDR 1995
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Bis(2-Ethylhexyl)phthalate	mouse	0.03	105 days	oral in diet	reproduction	183.3	18.3	Sample et al. 1996
Butylbenzylphthalate	rat	0.35	2 years	oral in diet	hepatic	2400	240	NTP 1997
Carbazole	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Chrysene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Dibenzofuran	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Diethylphthalate	mouse	0.03	105 days	oral in diet	reproduction	45830	4583	Sample et al. 1996
Di-n-butylphthalate	mouse	0.03	105 days	oral in diet	reproduction	1833	550	Sample et al. 1996
Di-n-octylphthalate	mouse	0.03	105 days	oral in diet	reproduction	550	55	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	hepatic	1250	125	ATSDR 1995
Fluorene	mouse	0.03	13 weeks	oral (gavage)	hematological	1250	125	ATSDR 1995
Hexachlorobutadiene	rat	0.35	90 days +	oral	reproduction	20	2	IPCS 1994
Hexachlorobenzene	rat	0.35	2 years	oral	reproduction	16	1.6	ATSDR 1989
Hexachlorocyclopentadiene	rat	0.35	GD 6-15	oral	reproduction	30	10	USEPA 1984
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (intubation)	reproduction	10	1	Sample et al. 1996
Naphthalene	mouse	0.03	13 weeks	oral (gavage)	reproduction	1400	140	ATSDR 1995
N-Nitrosodiphenylamine	rat	0.35	8 to 11 weeks	oral in diet	systemic	1500	150	ATSDR 1993
Pentachlorophenol	rat	0.35	up to 24 months	oral in diet	reproduction	30	3	Coulston and Kolbye 1994
Phenanthrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995
Pyrene	mouse	0.03	19 to 29 days	oral in diet	reproduction	1330	133	ATSDR 1995

Table 6-2
Ingestion Screening Values for Birds
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	mortality	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1	128 days	oral in diet	mortality	12.84	5.14	Sample et al. 1996
Cadmium	mallard	1.153	90 days	oral in diet	reproduction	20	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5	1	Sample et al. 1996
Copper	chicks	0.534	10 weeks	oral in diet	growth/mortality	61.7	47	Sample et al. 1996
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	38.5	3.85	Sample et al. 1996
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.9	0.45	Sample et al. 1996
Mercury	mallard	1	3 generations	oral in diet	reproduction	0.064	0.0064	Sample et al. 1996
Nickel	mallard	0.782	90 days	oral in diet	growth/mortality	107	77.4	Sample et al. 1996
Selenium	mallard	1	100 days	oral in diet	reproduction	0.8	0.4	Sample et al. 1996
Selenium	screech owl	0.2	13.7 weeks	oral in diet	reproduction	1.5	0.44	Sample et al. 1996
Silver	mallard	--	14 days	oral	--	1780	178	USEPA 1999
Zinc	chicken	1.935	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	--	--	--	--	--	NA	NA	--
1,2-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,3-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
1,4-Dichlorobenzene	northern bobwhite	0.157	14 days	oral (gavage)	growth/mortality	2500	250	Grimes and Jaber 1989
2,4,5-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4,6-Trichlorophenol	--	--	--	--	--	NA	NA	--
2,4-Dichlorophenol	--	--	--	--	--	NA	NA	--
2-Chloronaphthalene	--	--	--	--	--	NA	NA	--
2-Methylnaphthalene	--	--	--	--	--	NA	NA	--
3,3'-Dichlorobenzidine	--	--	--	--	--	NA	NA	--
4-Bromophenyl-Phenylether	--	--	--	--	--	NA	NA	--
4-Chloro-3-Methylphenol	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-Phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Acenaphthylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Anthracene	mallard	1.043	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
Benzo(a)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Benzo(k)fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Bis(2-Ethylhexyl)phthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	11	1.1	Sample et al. 1996
Butylbenzylphthalate	--	--	--	--	--	NA	NA	--
Carbazole	--	--	--	--	--	NA	NA	--
Chrysene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Dibenzofuran	--	--	--	--	--	NA	NA	--
Diethylphthalate	--	--	--	--	--	NA	NA	--
Di-n-butylphthalate	ringed dove	0.155	4 weeks	oral in diet	reproduction	1.1	0.11	Sample et al. 1996
Di-n-octylphthalate	ring-necked pheasant	1	--	--	mortality	500	50	TERRETOX 1998
Fluoranthene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Fluorene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Hexachlorobutadiene	Japanese quail	0.19	90 days	oral	reproduction	8	2.5	Coulston and Kolbye 1994; IPCS 1994
Hexachlorobenzene	Japanese quail	0.19	--	oral	reproduction	0.8	0.08	Coulston and Kolbye 1994
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Naphthalene	mallard	1.04	7 months	oral in diet	hepatic	228	22.8	Patton and Dieter 1980
N-Nitrosodiphenylamine	--	--	--	--	--	NA	NA	--
Pentachlorophenol	chicken	1.5	8 weeks	oral	growth	200	100	Eisler 1989
Phenanthrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963
Pyrene	chicken	1.5	34 days	oral in diet	reproduction	395	39.5	Rigdon and Neal 1963

Table 6-3
Bioaccumulative Chemicals List and Log K_{ow} Values
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference
Semivolatile Organics			
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995
1,2-Dichlorobenzene	3.20 to 3.61	3.43	USEPA 1995
1,3-Dichlorobenzene	Not reported	3.50	USEPA 1996
1,4-Dichlorobenzene	3.26 to 3.78	3.42	USEPA 1995
4-Bromophenyl-Phenylether	4.89 to 5.24	5.00	USEPA 1995
4-Chloro-3-Methylphenol	Not reported	3.10	USEPA 1996
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995
Acenaphthylene	Not reported	4.10	USEPA 1996
Anthracene	3.45 to 4.80	4.55	USEPA 1995
Benzo(a)anthracene	4.00 to 5.79	5.70	USEPA 1995
Benzo(a)pyrene	5.98 to 6.42	6.11	USEPA 1995
Benzo(b)fluoranthene	5.79 to 6.40	6.20	USEPA 1995
Benzo(g,h,i)perylene	6.63 to 7.05	6.70	USEPA 1995
Benzo(k)fluoranthene	6.12 to 6.27	6.20	USEPA 1995
Chrysene	5.41 to 5.79	5.70	USEPA 1995
Dibenz(a,h)anthracene	6.50 to 6.88	6.69	USEPA 1995
Fluoranthene	4.31 to 5.39	5.12	USEPA 1995
Fluorene	4.04 to 4.40	4.21	USEPA 1995
Hexachloro-1,3-butadiene	4.74 to 5.16	4.81	USEPA 1995
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995
Indeno(1,2,3-cd)pyrene	6.58 to 6.72	6.65	USEPA 1995
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995
Phenanthrene	4.28 to 4.57	4.55	USEPA 1995
Pyrene	4.76 to 5.52	5.11	USEPA 1995

Table 6-4
Maximum Soil Bioconcentration Factors
Used for Plants and Soil Invertebrates
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	1.103	Bechtel Jacobs 1998a	0.523	Sample et al. 1998a
Cadmium	3.25	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a
Chromium	0.0075	Baes et al. 1984	3.162	Sample et al. 1998a
Copper	0.625	Bechtel Jacobs 1998a	1.531	Sample et al. 1998a
Lead	0.468	Bechtel Jacobs 1998a	1.522	Sample et al. 1998a
Mercury	5	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a
Nickel	1.411	Bechtel Jacobs 1998a	4.73	Sample et al. 1998a
Selenium	3.012	Bechtel Jacobs 1998a	1.34	Sample et al. 1998a
Silver	0.4	Baes et al. 1984	1	--
Zinc	1.82	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	8.4	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.1653	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.2157	Travis and Arms 1988	0.2	Beyer and Stafford 1993
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.6255	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.3	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Bis(2-Ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1	--
Carbazole	0.3258	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Dibenzofuran	0.1447	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.2	Beyer and Stafford 1993
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Naphthalene	0.4425	Travis and Arms 1988	0.21	Beyer and Stafford 1993
N-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	8	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993

Table 6-5
Average Tendency Soil Bioaccumulation Factors
Used for Plants and Soil Invertebrates
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.0371	Bechtel Jacobs 1998a	0.258	Sample et al. 1998a
Cadmium	0.514	Bechtel Jacobs 1998a	7.66	Sample et al. 1998a
Chromium	0.0075	Baes et al. 1984	0.32	Sample et al. 1998a
Copper	0.123	Bechtel Jacobs 1998a	0.468	Sample et al. 1998a
Lead	0.0377	Bechtel Jacobs 1998a	0.307	Sample et al. 1998a
Mercury	0.344	Bechtel Jacobs 1998a	1.186	Sample et al. 1998a
Nickel	0.034	Bechtel Jacobs 1998a	1.656	Sample et al. 1998a
Selenium	0.567	Bechtel Jacobs 1998a	0.982	Sample et al. 1998a
Silver	0.4	Baes et al. 1984	1	--
Zinc	0.358	Bechtel Jacobs 1998a	2.482	Sample et al. 1998a
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	3.2	van Gestel and Ma 1988
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.1653	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.2157	Travis and Arms 1988	0.2	Beyer and Stafford 1993
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.6255	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	0.3	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Bis(2-Ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1	--
Carbazole	0.3258	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Dibenzofuran	0.1447	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.2	Beyer and Stafford 1993
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Naphthalene	0.4425	Travis and Arms 1988	0.21	Beyer and Stafford 1993
N-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	5.18	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993

Table 6-6
Maximum Soil Bioaccumulation Factors Used for Small Mammals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.014	Sample et al. 1998b	0.016	Sample et al. 1998b	0.0149	Sample et al. 1998b
Cadmium	0.462	Sample et al. 1998b	0.448	Sample et al. 1998b	7.017	Sample et al. 1998b
Chromium	0.349	Sample et al. 1998b	0.309	Sample et al. 1998b	0.3333	Sample et al. 1998b
Copper	0.554	Sample et al. 1998b	1.29	Sample et al. 1998b	1.117	Sample et al. 1998b
Lead	0.286	Sample et al. 1998b	0.187	Sample et al. 1998b	0.339	Sample et al. 1998b
Mercury	0.13	Sample et al. 1998b	0.192	Sample et al. 1998b	0.192	Sample et al. 1998b
Nickel	0.589	Sample et al. 1998b	0.898	Sample et al. 1998b	0.578	Sample et al. 1998b
Selenium	1.263	Sample et al. 1998b	0.155	Sample et al. 1998b	1.1867	Sample et al. 1998b
Silver	--	see text	--	see text	--	see text
Zinc	2.7822	Sample et al. 1998b	2.3168	Sample et al. 1998b	2.9011	Sample et al. 1998b
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
2,4,5-Trichlorophenol	--	see text	--	see text	--	see text
2,4,6-Trichlorophenol	--	see text	--	see text	--	see text
2,4-Dichlorophenol	--	see text	--	see text	--	see text
2-Chloronaphthalene	--	see text	--	see text	--	see text
2-Methylnaphthalene	--	see text	--	see text	--	see text
3,3'-Dichlorobenzidine	--	see text	--	see text	--	see text
4-Bromophenyl-Phenylether	--	see text	--	see text	--	see text
4-Chloro-3-Methylphenol	--	see text	--	see text	--	see text
4-Chlorophenyl-Phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Bis(2-Ethylhexyl)phthalate	--	see text	--	see text	--	see text
Butylbenzylphthalate	--	see text	--	see text	--	see text
Carbazole	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Dibenzofuran	--	see text	--	see text	--	see text
Diethylphthalate	--	see text	--	see text	--	see text
Di-n-butylphthalate	--	see text	--	see text	--	see text
Di-n-octylphthalate	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Naphthalene	--	see text	--	see text	--	see text
N-Nitrosodiphenylamine	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text

Table 6-7
Average Soil Bioaccumulation Factors Used for Small Mammals
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.0033	Sample et al. 1998b	0.0054	Sample et al. 1998b	0.0039	Sample et al. 1998b
Cadmium	0.144	Sample et al. 1998b	0.134	Sample et al. 1998b	2.212	Sample et al. 1998b
Chromium	0.092	Sample et al. 1998b	0.1249	Sample et al. 1998b	0.0939	Sample et al. 1998b
Copper	0.1107	Sample et al. 1998b	0.109	Sample et al. 1998b	0.5017	Sample et al. 1998b
Lead	0.0548	Sample et al. 1998b	0.0406	Sample et al. 1998b	0.1478	Sample et al. 1998b
Mercury	0.0731	Sample et al. 1998b	0.0672	Sample et al. 1998b	0.0672	Sample et al. 1998b
Nickel	0.2587	Sample et al. 1998b	0.2631	Sample et al. 1998b	0.3487	Sample et al. 1998b
Selenium	0.2579	Sample et al. 1998b	0.0221	Sample et al. 1998b	0.273	Sample et al. 1998b
Silver	--	see text	--	see text	--	see text
Zinc	0.5092	Sample et al. 1998b	0.2929	Sample et al. 1998b	0.862	Sample et al. 1998b
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
2,4,5-Trichlorophenol	--	see text	--	see text	--	see text
2,4,6-Trichlorophenol	--	see text	--	see text	--	see text
2,4-Dichlorophenol	--	see text	--	see text	--	see text
2-Chloronaphthalene	--	see text	--	see text	--	see text
2-Methylnaphthalene	--	see text	--	see text	--	see text
3,3'-Dichlorobenzidine	--	see text	--	see text	--	see text
4-Bromophenyl-Phenylether	--	see text	--	see text	--	see text
4-Chloro-3-Methylphenol	--	see text	--	see text	--	see text
4-Chlorophenyl-Phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Bis(2-Ethylhexyl)phthalate	--	see text	--	see text	--	see text
Butylbenzylphthalate	--	see text	--	see text	--	see text
Carbazole	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Dibenzofuran	--	see text	--	see text	--	see text
Diethylphthalate	--	see text	--	see text	--	see text
Di-n-butylphthalate	--	see text	--	see text	--	see text
Di-n-octylphthalate	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Naphthalene	--	see text	--	see text	--	see text
N-Nitrosodiphenylamine	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text

Table 6-8
Maximum Sediment Bioaccumulation Factors
Used for Aquatic Plants and Frogs
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	1.103	Bechtel Jacobs 1998a	0.126	Pascoe et al. 1996
Cadmium	3.25	Bechtel Jacobs 1998a	0.164	Pascoe et al. 1996
Chromium	0.0075	Baes et al. 1984	0.038	Krantzberg and Boyd 1992
Copper	0.625	Bechtel Jacobs 1998a	0.1	Krantzberg and Boyd 1992
Lead	0.468	Bechtel Jacobs 1998a	0.07	Krantzberg and Boyd 1992
Mercury	5	Bechtel Jacobs 1998a	4.58	Cope et al. 1990
Nickel	1.411	Bechtel Jacobs 1998a	1	--
Selenium	3.012	Bechtel Jacobs 1998a	1	--
Silver	0.4	Baes et al. 1984	1	--
Zinc	1.82	Bechtel Jacobs 1998a	0.147	Pascoe et al. 1996
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	1	--
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	1	--
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.1653	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.2157	Travis and Arms 1988	1	--
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.6255	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	1	--
Acenaphthylene	0.1653	Travis and Arms 1988	1	--
Anthracene	0.0908	Travis and Arms 1988	1	--
Benzo(a)anthracene	0.0197	Travis and Arms 1988	1	--
Benzo(a)pyrene	0.0114	Travis and Arms 1988	1	--
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	1	--
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	1	--
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	1	--
Bis(2-Ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1	--
Carbazole	0.3258	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	1	--
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	1	--
Dibenzofuran	0.1447	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	1	--
Fluorene	0.1428	Travis and Arms 1988	1	--
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1	--
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	1	--
Naphthalene	0.4425	Travis and Arms 1988	1	--
N-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	1	--
Phenanthrene	0.0908	Travis and Arms 1988	1	--
Pyrene	0.0431	Travis and Arms 1988	1	--

Table 6-9
Average Sediment Bioaccumulation Factors
Used for Aquatic Plants and Frogs
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.0371	Bechtel Jacobs 1998a	0.126	Pascoe et al. 1996
Cadmium	0.514	Bechtel Jacobs 1998a	0.164	Pascoe et al. 1996
Chromium	0.0075	Baes et al. 1984	0.038	Krantzberg and Boyd 1992
Copper	0.123	Bechtel Jacobs 1998a	0.1	Krantzberg and Boyd 1992
Lead	0.0377	Bechtel Jacobs 1998a	0.07	Krantzberg and Boyd 1992
Mercury	0.344	Bechtel Jacobs 1998a	3.25	Cope et al. 1990
Nickel	0.034	Bechtel Jacobs 1998a	1	--
Selenium	0.567	Bechtel Jacobs 1998a	1	--
Silver	0.4	Baes et al. 1984	1	--
Zinc	0.358	Bechtel Jacobs 1998a	0.147	Pascoe et al. 1996
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	1	--
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1	--
2,4,5-Trichlorophenol	0.2157	Travis and Arms 1988	1	--
2,4,6-Trichlorophenol	0.2814	Travis and Arms 1988	1	--
2,4-Dichlorophenol	0.6423	Travis and Arms 1988	1	--
2-Chloronaphthalene	0.1653	Travis and Arms 1988	1	--
2-Methylnaphthalene	0.2157	Travis and Arms 1988	1	--
3,3'-Dichlorobenzidine	0.3624	Travis and Arms 1988	1	--
4-Bromophenyl-Phenylether	0.0499	Travis and Arms 1988	1	--
4-Chloro-3-Methylphenol	0.6255	Travis and Arms 1988	1	--
4-Chlorophenyl-Phenylether	0.0533	Travis and Arms 1988	1	--
Acenaphthene	0.21	Travis and Arms 1988	1	--
Acenaphthylene	0.1653	Travis and Arms 1988	1	--
Anthracene	0.0908	Travis and Arms 1988	1	--
Benzo(a)anthracene	0.0197	Travis and Arms 1988	1	--
Benzo(a)pyrene	0.0114	Travis and Arms 1988	1	--
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	1	--
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	1	--
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	1	--
Bis(2-Ethylhexyl)phthalate	0.0023	Travis and Arms 1988	1	--
Butylbenzylphthalate	0.0617	Travis and Arms 1988	1	--
Carbazole	0.3258	Travis and Arms 1988	1	--
Chrysene	0.0197	Travis and Arms 1988	1	--
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	1	--
Dibenzofuran	0.1447	Travis and Arms 1988	1	--
Diethylphthalate	1.39	Travis and Arms 1988	1	--
Di-n-butylphthalate	0.0838	Travis and Arms 1988	1	--
Di-n-octylphthalate	0.0008	Travis and Arms 1988	1	--
Fluoranthene	0.0425	Travis and Arms 1988	1	--
Fluorene	0.1428	Travis and Arms 1988	1	--
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1	--
Hexachlorobenzene	0.0153	Travis and Arms 1988	1	--
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1	--
Hexachloroethane	0.1888	Travis and Arms 1988	1	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	1	--
Naphthalene	0.4425	Travis and Arms 1988	1	--
N-Nitrosodiphenylamine	0.5775	Travis and Arms 1988	1	--
Pentachlorophenol	0.0443	Travis and Arms 1988	1	--
Phenanthrene	0.0908	Travis and Arms 1988	1	--
Pyrene	0.0431	Travis and Arms 1988	1	--

Table 6-10
Maximum Sediment Bioaccumulation Factors
Used for Aquatic Invertebrates
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Sediment-Invertebrate BAF (dry weight)	
	Value	Reference
Inorganics		
Arsenic	0.675	Bechtel Jacobs 1998b
Cadmium	3.073	Bechtel Jacobs 1998b
Chromium	0.186	Bechtel Jacobs 1998b
Copper	7.957	Bechtel Jacobs 1998b
Lead	0.326	Bechtel Jacobs 1998b
Mercury	1.735	Bechtel Jacobs 1998b
Nickel	0.214	Bechtel Jacobs 1998b
Selenium	1	--
Silver	0.18	Hirsch 1998
Zinc	4.759	Bechtel Jacobs 1998b
Semivolatile Organic Compounds		
1,2,4-Trichlorobenzene	1	--
1,2-Dichlorobenzene	1	--
1,3-Dichlorobenzene	1	--
1,4-Dichlorobenzene	1	--
2,4,5-Trichlorophenol	1	--
2,4,6-Trichlorophenol	1	--
2,4-Dichlorophenol	1	--
2-Chloronaphthalene	1	--
2-Methylnaphthalene	1	--
3,3'-Dichlorobenzidine	1	--
4-Bromophenyl-Phenylether	1	--
4-Chloro-3-Methylphenol	1	--
4-Chlorophenyl-Phenylether	1	--
Acenaphthene	2.04	Maruya et al. 1997
Acenaphthylene	1	--
Anthracene	0.271	Maruya et al. 1997
Benzo(a)anthracene	1.4	Maruya et al. 1997
Benzo(a)pyrene	0.191	Maruya et al. 1997
Benzo(b)fluoranthene	0.16	Maruya et al. 1997
Benzo(g,h,i)perylene	0.295	Maruya et al. 1997
Benzo(k)fluoranthene	0.421	Maruya et al. 1997
Bis(2-Ethylhexyl)phthalate	1	--
Butylbenzylphthalate	1	--
Carbazole	1	--
Chrysene	0.335	Maruya et al. 1997
Dibenz(a,h)anthracene	1	--
Dibenzofuran	1	--
Diethylphthalate	1	--
Di-n-butylphthalate	1	--
Di-n-octylphthalate	1	--
Fluoranthene	0.312	Maruya et al. 1997
Fluorene	1.13	Maruya et al. 1997
Hexachlorobutadiene	1	--
Hexachlorobenzene	1	--
Hexachlorocyclopentadiene	1	--
Hexachloroethane	1	--
Indeno(1,2,3-cd)pyrene	0.355	Maruya et al. 1997
Naphthalene	1	--
N-Nitrosodiphenylamine	1	--
Pentachlorophenol	1	--
Phenanthrene	0.652	Maruya et al. 1997
Pyrene	0.803	Maruya et al. 1997

Table 6-11
Average Sediment Bioaccumulation Factors
Used for Aquatic Invertebrates
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Sediment-Invertebrate BAF (dry weight)	
	Value	Reference
Inorganics		
Arsenic	0.437	Bechtel Jacobs 1998b
Cadmium	0.679	Bechtel Jacobs 1998b
Chromium	0.09	Bechtel Jacobs 1998b
Copper	0.919	Bechtel Jacobs 1998b
Lead	0.338	Bechtel Jacobs 1998b
Mercury	1.022	Bechtel Jacobs 1998b
Nickel	0.129	Bechtel Jacobs 1998b
Selenium	1	--
Silver	0.18	Hirsch 1998
Zinc	0.954	Bechtel Jacobs 1998b
Semivolatile Organic Compounds		
1,2,4-Trichlorobenzene	1	--
1,2-Dichlorobenzene	1	--
1,3-Dichlorobenzene	1	--
1,4-Dichlorobenzene	1	--
2,4,5-Trichlorophenol	1	--
2,4,6-Trichlorophenol	1	--
2,4-Dichlorophenol	1	--
2-Chloronaphthalene	1	--
2-Methylnaphthalene	1	--
3,3'-Dichlorobenzidine	1	--
4-Bromophenyl-Phenylether	1	--
4-Chloro-3-Methylphenol	1	--
4-Chlorophenyl-Phenylether	1	--
Acenaphthene	2.04	Maruya et al. 1997
Acenaphthylene	1	--
Anthracene	0.191	Maruya et al. 1997
Benzo(a)anthracene	0.358	Maruya et al. 1997
Benzo(a)pyrene	0.127	Maruya et al. 1997
Benzo(b)fluoranthene	0.15	Maruya et al. 1997
Benzo(g,h,i)perylene	0.215	Maruya et al. 1997
Benzo(k)fluoranthene	0.232	Maruya et al. 1997
Bis(2-Ethylhexyl)phthalate	1	--
Butylbenzylphthalate	1	--
Carbazole	1	--
Chrysene	0.198	Maruya et al. 1997
Dibenz(a,h)anthracene	1	--
Dibenzofuran	1	--
Diethylphthalate	1	--
Di-n-butylphthalate	1	--
Di-n-octylphthalate	1	--
Fluoranthene	0.212	Maruya et al. 1997
Fluorene	0.481	Maruya et al. 1997
Hexachlorobutadiene	1	--
Hexachlorobenzene	1	--
Hexachlorocyclopentadiene	1	--
Hexachloroethane	1	--
Indeno(1,2,3-cd)pyrene	0.173	Maruya et al. 1997
Naphthalene	1	--
N-Nitrosodiphenylamine	1	--
Pentachlorophenol	1	--
Phenanthrene	0.294	Maruya et al. 1997
Pyrene	0.435	Maruya et al. 1997

Table 6-12
Assessment and Measurement Endpoints for the Lab Area
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Assessment Endpoint	Reason for Selection	Risk Question	Surrogate Organism	Measurement Endpoint
Growth, survival and reproduction of benthic invertebrate communities	Benthic invertebrates decompose organic matter and are an important prey base for many other organisms.	Are chemicals in surface water and/or sediment causing a reduction in the growth, survival and/or reproduction of the benthic invertebrate community?	Benthic Invertebrates	Comparison of the ratio of maximum medium-specific site concentrations and ecological screening values for benthic invertebrates to a reference hazard quotient of 1.
Growth, survival and reproduction of aquatic/wetland plant community	Aquatic/wetland plants provide cover and are a food source for many animals.	Are chemicals in surface water and/or sediment causing a reduction in the growth, survival and/or reproduction of the aquatic/wetland plant community?	Aquatic/Wetland Plants	Comparison of the ratio of maximum chemical concentrations in surface water and/or sediment and medium-specific screening values to a reference hazard quotient of 1.
Growth, survival and reproduction of amphibian community	Aquatic habitat on the site supports the development of larval amphibians.	Are chemicals in surface water and/or sediment causing a reduction in the growth, survival and/or reproduction of the amphibian community?	Amphibians	Comparison of the ratio of maximum chemical concentrations in surface water and/or sediment and medium-specific screening values to a reference hazard quotient of 1.
Growth, survival and reproduction of soil invertebrate communities	Soil invertebrates play an important role in the processing of organic matter and serve as a prey base for higher order animals.	Are chemicals in soil causing a reduction in the growth, survival and/or reproduction of the soil invertebrate community?	Soil Invertebrates (primarily earthworms)	Comparison of the ratio of maximum soil concentrations and soil screening values to a reference hazard quotient of 1.
Growth, survival and reproduction of terrestrial plant communities	Terrestrial plants provide cover, nesting sites, and food for a variety of animals.	Are chemicals in soil causing a reduction in the growth, survival and/or reproduction of the terrestrial plant community?	Terrestrial plants	Comparison of the ratio of maximum soil concentrations and soil screening values to a reference hazard quotient of 1.
Growth, survival and reproduction of avian vermivores	Avian vermivores are second order consumers that may be highly exposed to chemicals that biomagnify. They may also be at greater risk due to their small body size, high metabolic rate, and contact with soils.	Are chemicals in prey causing a reduction in the growth, survival and/or reproduction of avian vermivores?	American robin	Comparison of the ratio of maximum exposure dose and reference toxicity value to a reference hazard quotient of 1.
Growth, survival and reproduction of semi-aquatic omnivores	Semi-aquatic omnivores often have significant contact with sediment while foraging.	Are chemicals in food, sediment, soil, or surface water causing a reduction in the growth, survival and/or reproduction of semi-aquatic omnivores?	Raccoon	Comparison of the ratio of maximum exposure dose and reference toxicity value to a reference hazard quotient of 1.
Growth, survival and reproduction of terrestrial, avian carnivores	Terrestrial, avian carnivores are top-level predators. They may be highly exposed to contaminants that biomagnify through the food chain.	Are chemicals in prey causing a reduction in the growth, survival and/or reproduction of avian terrestrial carnivores?	Red-tailed Hawk	Comparison of the ratio of maximum exposure dose and reference toxicity value to a reference hazard quotient of 1.
Growth, survival and reproduction of terrestrial omnivores	Many terrestrial omnivores are a prey base for top level predators.	Are chemicals in prey causing a reduction in the growth, survival and/or reproduction of semi-aquatic omnivores?	White-footed mouse	Comparison of the ratio of maximum exposure dose and reference toxicity value to a reference hazard quotient of 1.

Table 6-13
Exposure Parameters for Upper Trophic Level
Ecological Receptors; Maximum Values
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)		Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Value	Reference	Value	Reference	Value	Reference	Terr. Plants	Soil Invert.	Small Mammals	Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds															
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.01015	Levey and Karasov 1989	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Red-tailed hawk	0.957	USEPA 1993	0.06796	allometric equation	0.03952	Sample and Suter 1994	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals															
Raccoon	4.23	Silva and Downing 1995	0.60919	allometric equation	0.12681	Conover 1989	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
White-footed mouse	0.0141	Silva and Downing 1995	0.00915	Sample and Suter 1994	0.00073	Sample and Suter 1994	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 6-14
Step 2 Screening - Lab Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (mg/kg)								
Aluminum	1.60 - 3.00	81 / 81	12,000	IS53SS270001	50.0	81 / 81	240	YES
Antimony	0.62 - 1.00	33 / 81	17.8	IS53SS280001	5.00	3 / 81	3.56	YES
Arsenic	0.50 - 1.00	81 / 81	66.1	IS53SS260001	60.0	2 / 81	1.10	YES
Barium	0.060 - 0.10	81 / 81	799	IS53SS570001	500	1 / 81	1.60	YES
Beryllium	0.020 - 0.34	64 / 81	0.63	IS53SS320001	10.0	0 / 81	0.063	NO
Cadmium	0.080 - 0.14	65 / 81	31.2	IS53SS260001	4.00	9 / 81	7.80	YES
Calcium [2]	0.62 - 1.00	81 / 81	99,000	IS49SS020001	NSV	-- / --	NSV	NO
Chromium	0.16 - 0.27	81 / 81	124	IS53SS260001	0.40	81 / 81	310	YES
Cobalt	0.20 - 0.34	81 / 81	18.9	IS53SS750001	100	0 / 81	0.19	NO
Copper	0.16 - 0.27	81 / 81	4,000	IS53SS460001	50.0	25 / 81	80.0	YES
Cyanide	0.50 - 0.85	3 / 81	1.40	IS53SS260001	0.060	3 / 81	23.3	YES
Iron	2.90 - 5.00	81 / 81	32,600	IS53SS260001	200	81 / 81	163	YES
Lead	0.50 - 1.00	81 / 81	31,200	IS53SS260001	50.0	63 / 81	624	YES
Magnesium [2]	1.60 - 3.00	81 / 81	9,300	IS53SS420001	4,400	6 / 81	2.11	NO
Manganese	0.040 - 0.070	81 / 81	713	IS53SS740001	330	10 / 81	2.16	YES
Mercury	0.040 - 32.0	76 / 80	962	IS53SD18	0.10	76 / 80	9,620	YES
Nickel	0.34 - 1.00	81 / 81	76.7	IS49SS010001	30.0	4 / 81	2.56	YES
Potassium [2]	6.00 - 11.0	81 / 81	927	IS53SS510001	NSV	-- / --	NSV	NO
Selenium	0.64 - 1.00	14 / 81	1.30	IS53SS110001	1.80	0 / 81	0.72	NO
Silver	0.26 - 0.44	61 / 81	19.6	IS53SS340001	2.00	8 / 81	9.80	YES
Sodium [2]	53.8 - 90.2	36 / 81	1,470	IS53SS260001	NSV	-- / --	NSV	NO
Thallium	0.78 - 1.10	16 / 81	2.50	IS53SD17	1.00	13 / 81	2.50	YES
Vanadium	7.00 - 12.0	80 / 81	38.2	IS53SS570001	2.00	80 / 81	19.1	YES
Zinc	0.010 - 0.14	81 / 81	6,000	IS53SS260001	50.0	70 / 81	120	YES
Semivolatile Organic Compounds (µg/kg)								
1,1-Biphenyl	340 - 560	1 / 20	58.0	IS53SS200001	NSV	-- / --	NSV	YES
2,2'-Oxybis(1-chloropropane)	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	850 - 1,400	0 / 20	--	--	430	-- / --	3.26	YES
2,4,6-Trichlorophenol	340 - 560	0 / 20	--	--	580	-- / --	0.97	NO
2,4-Dichlorophenol	340 - 560	0 / 20	--	--	13,400	-- / --	0.042	NO
2,4-Dimethylphenol	340 - 560	0 / 20	--	--	100	-- / --	5.60	YES
2,4-Dinitrophenol	850 - 1,400	0 / 20	--	--	20,000	-- / --	0.070	NO
2-Chloronaphthalene	340 - 560	0 / 20	--	--	1,033	-- / --	0.54	NO
2-Chlorophenol	340 - 560	0 / 20	--	--	100	-- / --	5.60	YES
2-Methylnaphthalene	340 - 560	1 / 20	140	IS53SS200001	NSV	-- / --	NSV	YES
2-Methylphenol	340 - 560	0 / 20	--	--	100	-- / --	5.60	YES
2-Nitroaniline	850 - 1,400	0 / 20	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
3- and 4-Methylphenol	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	850 - 1,400	0 / 20	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	850 - 1,400	0 / 20	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC
WDC040230001.ZIP.KTM

Table 6-14
Step 2 Screening - Lab Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
4-Chloroaniline	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
4-Nitroaniline	850 - 1,400	0 / 20	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	850 - 1,400	0 / 20	--	--	380	-- / --	3.68	YES
Acenaphthene	340 - 560	2 / 20	1,200	IS53SS200001	2,500	0 / 20	0.48	NO
Acenaphthylene	340 - 560	1 / 20	53.0	IS53SS360001	100	0 / 20	0.53	NO
Acetophenone	340 - 560	4 / 20	260	IS53SS140001	NSV	-- / --	NSV	YES
Anthracene	330 - 560	7 / 20	2,900	IS53SS200001	100	4 / 20	29.0	YES
Atrazine	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	340 - 560	3 / 20	420	IS53SS140001	NSV	-- / --	NSV	YES
Benzo(a)anthracene	340 - 4,000	16 / 20	7,700	IS53SS200001	100	12 / 20	77.0	YES
Benzo(a)pyrene	340 - 4,000	16 / 20	6,300	IS53SS200001	100	12 / 20	63.0	YES
Benzo(b)fluoranthene	340 - 4,000	16 / 20	9,100	IS53SS200001	100	13 / 20	91.0	YES
Benzo(g,h,i)perylene	340 - 560	14 / 20	1,700	IS53SS200001	100	5 / 20	17.0	YES
Benzo(k)fluoranthene	340 - 560	13 / 20	2,800	IS53SS200001	100	7 / 20	28.0	YES
Butylbenzylphthalate	340 - 7,900	10 / 20	23,000	IS53SS010001	NSV	-- / --	NSV	YES
Caprolactam	340 - 480	0 / 9	--	--	NSV	-- / --	NSV	NO
Carbazole	340 - 560	5 / 20	1,600	IS53SS200001	NSV	-- / --	NSV	YES
Chrysene	340 - 4,000	16 / 20	7,900	IS53SS200001	100	13 / 20	79.0	YES
Di-n-butylphthalate	340 - 1,800	16 / 20	9,700	IS53SS350001	200,000	0 / 20	0.049	NO
Di-n-octylphthalate	340 - 560	1 / 20	170	IS53SS010001	NSV	-- / --	NSV	YES
Dibenz(a,h)anthracene	340 - 560	1 / 20	220	IS53SS200001	100	1 / 20	2.20	YES
Dibenzofuran	340 - 560	2 / 20	600	IS53SS200001	NSV	-- / --	NSV	YES
Diethylphthalate	340 - 560	6 / 20	210	IS53SS350001	13,400	0 / 20	0.016	NO
Dimethyl phthalate	340 - 560	3 / 20	450	IS53SS140001	10,640	0 / 20	0.042	NO
Fluoranthene	340 - 4,000	17 / 20	17,000	IS53SS200001	100	16 / 20	170	YES
Fluorene	340 - 560	2 / 20	1,100	IS53SS200001	1,700	0 / 20	0.65	NO
Hexachlorobenzene	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
Hexachlorobutadiene	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
Hexachlorocyclopentadiene	340 - 560	0 / 20	--	--	1,000	-- / --	0.56	NO
Hexachloroethane	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	340 - 560	15 / 20	1,900	IS53SS200001	100	5 / 20	19.0	YES
Isophorone	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
Naphthalene	340 - 560	2 / 20	350	IS53SS200001	100	1 / 20	3.50	YES
Pentachlorophenol	850 - 1,400	0 / 20	--	--	3,000	-- / --	0.47	NO
Phenanthrene	330 - 4,000	16 / 20	13,000	IS53SS200001	100	11 / 20	130	YES
Phenol	340 - 560	0 / 20	--	--	1,880	-- / --	0.30	NO
Pyrene	340 - 4,000	17 / 20	14,000	IS53SS200001	100	16 / 20	140	YES
bis(2-Chloroethoxy)methane	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	340 - 560	15 / 20	1,900	IS53SS010001	NSV	-- / --	NSV	YES
n-Nitroso-di-n-propylamine	340 - 560	0 / 20	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	340 - 560	0 / 20	--	--	1,090	-- / --	0.51	NO
Explosives (µg/kg)								
1,3,5-Trinitrobenzene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
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Table 6-14
Step 2 Screening - Lab Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,4,6-Trinitrotoluene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	340 - 840	4 / 81	7,300	IS53SS010001	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	340 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	480 - 840	1 / 81	2,135	IS53SS060001	NSV	-- / --	NSV	YES
2-Nitrotoluene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
HMX	480 - 57,000	1 / 81	268,364	IS53SS330001	NSV	-- / --	NSV	YES
Nitrobenzene	340 - 840	0 / 81	--	--	2,260	-- / --	0.37	NO
Nitrocellulose	1,500 - 4,300	22 / 80	75,000	IS53SD18	NSV	-- / --	NSV	YES
Nitroglycerin	48,000 - 84,000	0 / 81	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	100,000 - 970,000	0 / 81	--	--	NSV	-- / --	NSV	NO
PETN	48,000 - 84,000	0 / 81	--	--	NSV	-- / --	NSV	NO
Perchlorate	10.0 - 10.0	0 / 4	--	--	NSV	-- / --	NSV	NO
RDX	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
Tetryl	480 - 840	0 / 81	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
1,1,2,2-Tetrachloroethane	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
1,1,2-Trichloro-1,2,2- trifluoroethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
1,1-Dichloroethane	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
1,1-Dichloroethene	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
1,2,4-Trichlorobenzene	10.0 - 14.0	0 / 19	--	--	1,270	-- / --	0.011	NO
1,2-Dibromo-3-chloropropane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	10.0 - 14.0	0 / 19	--	--	5,000	-- / --	0.0028	NO
1,2-Dichlorobenzene	10.0 - 14.0	0 / 19	--	--	100	-- / --	0.14	NO
1,2-Dichloroethane	10.0 - 14.0	0 / 19	--	--	401	-- / --	0.035	NO
1,2-Dichloropropane	10.0 - 14.0	0 / 19	--	--	38,800	-- / --	3.61E-04	NO
1,3-Dichlorobenzene	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	10.0 - 14.0	0 / 19	--	--	1,280	-- / --	0.011	NO
2-Butanone	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
2-Hexanone	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	10.0 - 14.0	0 / 19	--	--	10,000	-- / --	0.0014	NO
Acetone	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Benzene	10.0 - 14.0	0 / 19	--	--	105	-- / --	0.13	NO
Bromodichloromethane	10.0 - 14.0	0 / 19	--	--	45,000	-- / --	3.11E-04	NO
Bromoform	10.0 - 14.0	0 / 19	--	--	114,700	-- / --	1.22E-04	NO
Bromomethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	10.0 - 14.0	0 / 19	--	--	1,000,000	-- / --	1.40E-05	NO
Chlorobenzene	10.0 - 14.0	0 / 19	--	--	2,400	-- / --	0.0058	NO
Chloroethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Chloroform	10.0 - 14.0	0 / 19	--	--	1,000	-- / --	0.014	NO

NSV - No Screening Value
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WDC040230001.ZIP.KTM

Table 6-14
Step 2 Screening - Lab Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Chloromethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Cumene	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Cyclohexane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	10.0 - 14.0	0 / 19	--	--	5,005	-- / --	0.0028	NO
Methyl acetate	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Methylcyclohexane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Methylene chloride	10.0 - 14.0	0 / 19	--	--	1,001	-- / --	0.014	NO
Styrene	10.0 - 14.0	0 / 19	--	--	10,010	-- / --	0.0014	NO
Tetrachloroethene	10.0 - 14.0	4 / 19	7.30	IS53SS560001	401	0 / 19	0.018	NO
Toluene	10.0 - 14.0	0 / 19	--	--	13,005	-- / --	0.0011	NO
Trichloroethene	10.0 - 14.0	0 / 19	--	--	6,000	-- / --	0.0023	NO
Trichlorofluoromethane	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
Xylene, total	10.0 - 14.0	0 / 19	--	--	2,505	-- / --	0.0056	NO
cis-1,2-Dichloroethene	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
cis-1,3-Dichloropropene	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
o-Xylene	10.0 - 14.0	0 / 19	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO
trans-1,3-Dichloropropene	10.0 - 14.0	0 / 19	--	--	300	-- / --	0.047	NO

NSV - No Screening Value
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Table 6-15
Step 2 Screening Levels - Lab Area Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (µg/l)								
Aluminum	7.90 - 7.90	1 / 1	514	IS53SW01	87.0	1 / 1	5.91	YES
Antimony	3.10 - 3.10	0 / 1	--	--	30.0	-- / --	0.10	NO
Arsenic	2.50 - 2.50	1 / 1	47.0	IS53SW01	150	0 / 1	0.31	NO
Barium	0.30 - 0.30	1 / 1	10.1	IS53SW01	1,000	0 / 1	0.010	NO
Beryllium	0.10 - 0.10	1 / 1	0.11	IS53SW01	5.30	0 / 1	0.021	NO
Cadmium	0.40 - 0.40	1 / 1	0.82	IS53SW01	0.83	0 / 1	0.99	NO
Calcium [2]	3.10 - 3.10	1 / 1	2,680	IS53SW01	NSV	-- / --	NSV	NO
Chromium	0.80 - 0.80	0 / 1	--	--	11.4	-- / --	0.070	NO
Cobalt	1.00 - 1.00	1 / 1	3.10	IS53SW01	23.0	0 / 1	0.13	NO
Copper	0.80 - 0.80	1 / 1	3.40	IS53SW01	2.85	1 / 1	1.19	YES
Cyanide	10.0 - 10.0	1 / 1	10.0	IS53SW01	5.20	1 / 1	1.92	YES
Iron	15.0 - 15.0	1 / 1	2,760	IS53SW01	320	1 / 1	8.63	YES
Lead	2.50 - 2.50	1 / 1	5.20	IS53SW01	0.54	1 / 1	9.55	YES
Magnesium [2]	7.90 - 7.90	2 / 1	846	IS53SW01	NSV	-- / --	NSV	NO
Manganese	0.20 - 0.20	2 / 1	1,300	IS53SW01	120	1 / 1	10.8	YES
Mercury	0.20 - 0.20	1 / 1	1.00	IS53SW01	0.91	1 / 1	1.10	YES
Nickel	1.70 - 1.70	0 / 1	--	--	16.1	-- / --	0.11	NO
Potassium [2]	31.0 - 31.0	1 / 1	2,590	IS53SW01	NSV	-- / --	NSV	NO
Selenium	3.20 - 3.20	1 / 1	4.90	IS53SW01	5.00	0 / 1	0.98	NO
Silver	1.30 - 1.30	0 / 1	--	--	0.36	-- / --	3.61	YES
Sodium [2]	270 - 270	1 / 1	95,100	IS53SW01	NSV	-- / --	NSV	NO
Thallium	3.90 - 3.90	0 / 1	--	--	40.0	-- / --	0.098	NO
Vanadium	34.9 - 34.9	0 / 1	--	--	10,000	-- / --	0.0035	NO
Zinc	0.50 - 0.50	1 / 1	28.2	IS53SW01	37.0	0 / 1	0.76	NO
Semivolatile Organic Compounds (µg/l)								
1,1-Biphenyl	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 1	--	--	63.0	-- / --	0.40	NO
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 1	--	--	970	-- / --	0.010	NO
2,4-Dichlorophenol	10.0 - 10.0	0 / 1	--	--	365	-- / --	0.027	NO

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Table 6-15
Step 2 Screening Levels - Lab Area Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,4-Dimethylphenol	10.0 - 10.0	0 / 1	--	--	530	-- / --	0.019	NO
2,4-Dinitrophenol	25.0 - 25.0	0 / 1	--	--	150	-- / --	0.17	NO
2-Chloronaphthalene	10.0 - 10.0	0 / 1	--	--	620	-- / --	0.016	NO
2-Chlorophenol	10.0 - 10.0	0 / 1	--	--	97.0	-- / --	0.10	NO
2-Methylnaphthalene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Methylphenol	10.0 - 10.0	0 / 1	--	--	13.0	-- / --	0.77	NO
2-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	10.0 - 10.0	0 / 1	--	--	150	-- / --	0.067	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
3- and 4-Methylphenol	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 1	--	--	2.30	-- / --	10.9	YES
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	1.50	-- / --	6.67	YES
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 1	--	--	0.30	-- / --	33.3	YES
4-Chloroaniline	10.0 - 10.0	0 / 1	--	--	50.0	-- / --	0.20	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Nitroaniline	25.0 - 25.0	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	25.0 - 25.0	0 / 1	--	--	150	-- / --	0.17	NO
Acenaphthene	10.0 - 10.0	0 / 1	--	--	520	-- / --	0.019	NO
Acenaphthylene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Acetophenone	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Anthracene	10.0 - 10.0	0 / 1	--	--	0.73	-- / --	13.7	YES
Atrazine	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	10.0 - 10.0	0 / 1	--	--	6.30	-- / --	1.59	YES
Benzo(a)pyrene	10.0 - 10.0	0 / 1	--	--	0.014	-- / --	714	YES
Benzo(b)fluoranthene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzo(k)fluoranthene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Butylbenzylphthalate	10.0 - 10.0	0 / 1	--	--	22.0	-- / --	0.45	NO
Caprolactam	-- - --	0 / 0	--	--	NSV	-- --	NSV	NO

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Table 6-15
Step 2 Screening Levels - Lab Area Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Carbazole	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Chrysene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Di-n-butylphthalate	10.0 - 10.0	0 / 1	--	--	33.0	-- / --	0.30	NO
Di-n-octylphthalate	10.0 - 10.0	0 / 1	--	--	3.00	-- / --	3.33	YES
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Dibenzofuran	10.0 - 10.0	0 / 1	--	--	20.0	-- / --	0.50	NO
Diethylphthalate	10.0 - 10.0	0 / 1	--	--	220	-- / --	0.045	NO
Dimethyl phthalate	10.0 - 10.0	0 / 1	--	--	330	-- / --	0.030	NO
Fluoranthene	10.0 - 10.0	0 / 1	--	--	398	-- / --	0.025	NO
Fluorene	10.0 - 10.0	0 / 1	--	--	430	-- / --	0.023	NO
Hexachlorobenzene	10.0 - 10.0	0 / 1	--	--	3.68	-- / --	2.72	YES
Hexachlorobutadiene	10.0 - 10.0	0 / 1	--	--	9.30	-- / --	1.08	YES
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 1	--	--	5.20	-- / --	1.92	YES
Hexachloroethane	10.0 - 10.0	0 / 1	--	--	540	-- / --	0.019	NO
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Isophorone	10.0 - 10.0	0 / 1	--	--	11,700	-- / --	8.55E-04	NO
Naphthalene	10.0 - 10.0	0 / 1	--	--	100	-- / --	0.10	NO
Pentachlorophenol	25.0 - 25.0	0 / 1	--	--	6.69	-- / --	3.74	YES
Phenanthrene	10.0 - 10.0	0 / 1	--	--	6.30	-- / --	1.59	YES
Phenol	10.0 - 10.0	0 / 1	--	--	256	-- / --	0.039	NO
Pyrene	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 1	--	--	1,100	-- / --	0.0091	NO
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 1	--	--	2,380	-- / --	0.0042	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 1	--	--	30.0	-- / --	0.33	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 1	--	--	585	-- / --	0.017	NO
Explosives (µg/l)								
1,3,5-Trinitrobenzene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	0.40 - 0.40	0 / 1	--	--	230	-- / --	0.0017	NO

NSV - No Screening Value
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Table 6-15
Step 2 Screening Levels - Lab Area Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,6-Dinitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
HMX	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	0.40 - 0.40	0 / 1	--	--	2,700	-- / --	1.48E-04	NO
Nitrocellulose	100 - 100	0 / 1	--	--	NSV	-- / --	NSV	NO
Nitroglycerin	40.0 - 40.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	80.0 - 80.0	0 / 1	--	--	NSV	-- / --	NSV	NO
PETN	40.0 - 40.0	0 / 1	--	--	NSV	-- / --	NSV	NO
Perchlorate	5.00 - 5.00	0 / 1	--	--	NSV	-- / --	NSV	NO
RDX	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO
Tetryl	0.40 - 0.40	0 / 1	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
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WDC040230001.ZIP.KTM

Table 6-16
Step 2 Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (mg/kg)								
Aluminum	2.00 - 4.00	2 / 2	9,660	IS53SD14	25,500	0 / 2	0.38	NO
Antimony	1.00 - 1.60	0 / 2	--	--	150	-- / --	0.011	NO
Arsenic	1.00 - 1.00	2 / 2	20.2	IS53SD14	8.20	1 / 2	2.46	YES
Barium	0.090 - 0.15	2 / 2	138	IS53SD14	500	0 / 2	0.28	NO
Beryllium	0.29 - 0.51	2 / 2	0.71	IS53SD14	NSV	-- / --	NSV	YES
Cadmium	0.11 - 0.20	2 / 2	1.10	IS53SD14	1.20	0 / 2	0.92	NO
Calcium [2]	1.00 - 2.00	2 / 2	2,280	IS53SD14	NSV	-- / --	NSV	NO
Chromium	0.23 - 0.40	2 / 2	16.4	IS53SD14	81.0	0 / 2	0.20	NO
Cobalt	0.29 - 1.00	2 / 2	28.0	IS53SD14	50.0	0 / 2	0.56	NO
Copper	0.23 - 0.40	2 / 2	28.2	IS53SD14	34.0	0 / 2	0.83	NO
Cyanide	0.72 - 1.26	0 / 2	--	--	0.10	-- / --	12.6	YES
Iron	4.00 - 7.00	2 / 2	17,000	IS53SD14	188,400	0 / 2	0.090	NO
Lead	1.00 - 1.00	2 / 2	82.8	IS53SD14	46.7	1 / 2	1.77	YES
Magnesium [2]	2.00 - 4.00	2 / 2	1,150	IS53SD14	NSV	-- / --	NSV	NO
Manganese	0.060 - 0.10	2 / 2	1,070	IS53SD14	460	2 / 2	2.33	YES
Mercury	1.00 - 2.00	2 / 2	24.5	IS53SD14	0.15	2 / 2	163	YES
Nickel	0.49 - 1.00	2 / 2	17.8	IS53SD14	20.9	0 / 2	0.85	NO
Potassium [2]	9.00 - 16.0	2 / 2	425	IS53SD14	NSV	-- / --	NSV	NO
Selenium	1.00 - 2.00	0 / 2	--	--	1.00	-- / --	2.00	YES
Silver	0.37 - 1.00	2 / 2	2.20	IS53SD14	1.00	1 / 2	2.20	YES
Sodium [2]	76.0 - 140	1 / 2	303	IS53SD14	NSV	-- / --	NSV	NO
Thallium	1.00 - 2.00	0 / 2	--	--	NSV	-- / --	NSV	NO
Vanadium	10.0 - 18.0	2 / 2	65.9	IS53SD14	57.0	1 / 2	1.16	YES
Zinc	0.010 - 0.030	2 / 2	189	IS53SD14	150	1 / 2	1.26	YES
Semivolatile Organic Compounds (µg/kg)								
1,1-Biphenyl	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2,2'-Oxybis(1-chloropropane)	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4,6-Trichlorophenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4-Dichlorophenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2,4-Dimethylphenol	830 - 830	0 / 1	--	--	29.0	-- / --	28.6	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC
WDC040230001.ZIP.KTM

Table 6-16
Step 2 Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,4-Dinitrophenol	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	830 - 830	0 / 1	--	--	70.0	-- / --	11.9	YES
2-Methylphenol	830 - 830	0 / 1	--	--	63.0	-- / --	13.2	YES
2-Nitroaniline	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
3- and 4-Methylphenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Nitroaniline	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	2,100 - 2,100	0 / 1	--	--	NSV	-- / --	NSV	NO
Acenaphthene	830 - 830	0 / 1	--	--	16.0	-- / --	51.9	YES
Acenaphthylene	830 - 830	0 / 1	--	--	44.0	-- / --	18.9	YES
Acetophenone	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Anthracene	830 - 830	0 / 1	--	--	85.3	-- / --	9.73	YES
Atrazine	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	830 - 830	0 / 1	--	--	261	-- / --	3.18	YES
Benzo(a)pyrene	830 - 830	0 / 1	--	--	430	-- / --	1.93	YES
Benzo(b)fluoranthene	830 - 830	0 / 1	--	--	3,200	-- / --	0.26	NO
Benzo(g,h,i)perylene	830 - 830	0 / 1	--	--	670	-- / --	1.24	YES
Benzo(k)fluoranthene	830 - 830	0 / 1	--	--	240	-- / --	3.46	YES
Butylbenzylphthalate	830 - 830	0 / 1	--	--	63.0	-- / --	13.2	YES
Caprolactam	-- - --	0 / 0	--	--	NSV	-- --	NSV	NO
Carbazole	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Chrysene	830 - 830	0 / 1	--	--	384	-- / --	2.16	YES

NSV - No Screening Value
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WDC040230001.ZIP.KTM

Table 6-16
Step 2 Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Di-n-butylphthalate	830 - 830	1 / 1	140	IS53SD14	1,400	0 / 1	0.10	NO
Di-n-octylphthalate	830 - 830	0 / 1	--	--	6,200	-- / --	0.13	NO
Dibenz(a,h)anthracene	830 - 830	0 / 1	--	--	63.4	-- / --	13.1	YES
Dibenzofuran	830 - 830	0 / 1	--	--	540	-- / --	1.54	YES
Diethylphthalate	830 - 830	0 / 1	--	--	200	-- / --	4.15	YES
Dimethyl phthalate	830 - 830	0 / 1	--	--	71.0	-- / --	11.7	YES
Fluoranthene	830 - 830	0 / 1	--	--	600	-- / --	1.38	YES
Fluorene	830 - 830	0 / 1	--	--	19.0	-- / --	43.7	YES
Hexachlorobenzene	830 - 830	0 / 1	--	--	22.0	-- / --	37.7	YES
Hexachlorobutadiene	830 - 830	0 / 1	--	--	11.0	-- / --	75.5	YES
Hexachlorocyclopentadiene	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	830 - 830	0 / 1	--	--	600	-- / --	1.38	YES
Isophorone	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
Naphthalene	830 - 830	0 / 1	--	--	160	-- / --	5.19	YES
Pentachlorophenol	2,100 - 2,100	0 / 1	--	--	360	-- / --	5.83	YES
Phenanthrene	830 - 830	0 / 1	--	--	240	-- / --	3.46	YES
Phenol	830 - 830	0 / 1	--	--	420	-- / --	1.98	YES
Pyrene	830 - 830	0 / 1	--	--	665	-- / --	1.25	YES
bis(2-Chloroethoxy)methane	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	830 - 830	0 / 1	--	--	1,300	-- / --	0.64	NO
n-Nitroso-di-n-propylamine	830 - 830	0 / 1	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	830 - 830	0 / 1	--	--	28.0	-- / --	29.6	YES
Explosives (µg/kg)								
1,3,5-Trinitrobenzene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC
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Table 6-16
Step 2 Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
3-Nitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
HMX	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitrocellulose	3,600 - 6,300	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitroglycerin	70,000 - 120,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	140,000 - 240,000	0 / 2	--	--	NSV	-- / --	NSV	NO
PETN	70,000 - 120,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Perchlorate	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	NO
RDX	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO
Tetryl	700 - 1,200	0 / 2	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC
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Table 6-17
Summary of Hazard Quotients for Food Web Exposures
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	White-footed mouse		Raccoon		Red fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	22.80	2.28	4.08	0.41	3.30	0.33	3.30	1.10	0.02	<0.01
Cadmium	33.68	3.37	0.12	0.01	6.96	0.70	187.02	13.56	0.40	0.03
Chromium	0.74	0.07	<0.01	<0.01	0.18	0.02	85.04	17.01	1.68	0.34
Copper	18.78	14.51	0.28	0.21	15.51	11.98	28.75	21.90	3.24	2.47
Lead	197.15	19.72	0.13	0.01	61.42	6.14	9274.84	927.48	79.15	7.91
Mercury	19138.33	3827.67	15.53	9.32	330.00	198.00	9432.34	4716.17	14.21	7.11
Nickel	0.29	0.15	0.01	<0.01	0.08	0.04	1.01	0.73	0.03	0.02
Selenium	0.75	0.46	0.54	0.33	0.31	0.19	0.88	0.26	0.09	0.03
Silver	0.04	<0.01	<0.01	<0.01	0.01	<0.01	0.02	<0.01	<0.01	<0.01
Zinc	13.64	6.82	0.79	0.08	38.17	3.82	1142.50	126.46	43.57	4.82
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.07	<0.01	0.02	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.07	<0.01	<0.01	<0.01	0.03	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.06	<0.01	<0.01	<0.01	0.04	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.10	0.01	<0.01	<0.01	0.05	<0.01	0.02	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.02	<0.01	<0.01
Hexachlorobenzene	0.02	<0.01	0.01	<0.01	<0.01	<0.01	2.62	0.26	0.04	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.03	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.10	<0.01	0.01	<0.01	0.03	<0.01	0.02	0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01

Table 6-18
Exposure Parameter for Upper Trophic Level
Ecological Receptors; Average Values
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)		Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Value	Reference	Value	Reference	Value	Reference	Terr. Plants	Soil Invert.	Small Mammals	Frogs	Aquatic Plants	Aquatic Invert.	Reference	Value	Reference
Birds															
American robin	0.0452	USEPA 1993	0.00741	allometric equation	0.01015	Levey and Karasov 1989	0	95	0	0	0	0	Martin et al. 1951	5	Sample and Suter 1994
Red-tailed hawk	1.126	Sample and Suter 1994	0.06388	allometric equation	0.03603	Sample and Suter 1994	0	0	100	0	0	0	USEPA 1993; Sample and Suter 1994	0	Sample and Suter 1994
Mammals															
Raccoon	5.94	Silva and Downing 1995	0.49209	allometric equation	0.10003	Conover 1989	0	0	0	7	40	43.6	USEPA 1993	9.4	Beyer et al. 1994
White-footed mouse	0.0208	Silva and Downing 1995	0.00624	Sample and Suter 1994	0.00050	Sample and Suter 1994	51	47	0	0	0	0	Martin et al. 1951; Sample and Suter 1994	2	Beyer et al. 1994

Table 6-19
Step 3A Screening - Laboratory Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (mg/kg)									
Aluminum	1.60 - 3.00	81 / 81	12,000	IS53SS270001	5,515	50.0	81 / 81	110	YES
Antimony	0.62 - 1.00	33 / 81	17.8	IS53SS280001	1.33	5.00	3 / 81	0.27	NO
Arsenic	0.50 - 1.00	81 / 81	66.1	IS53SS260001	11.0	60.0	2 / 81	0.18	NO
Barium	0.060 - 0.10	81 / 81	799	IS53SS570001	69.0	500	1 / 81	0.14	NO
Cadmium	0.080 - 0.14	65 / 81	31.2	IS53SS260001	1.89	4.00	9 / 81	0.47	NO
Chromium	0.16 - 0.27	81 / 81	124	IS53SS260001	18.9	0.40	81 / 81	47.3	YES
Copper	0.16 - 0.27	81 / 81	4,000	IS53SS460001	126	50.0	25 / 81	2.52	YES
Cyanide	0.50 - 0.85	3 / 81	1.40	IS53SS260001	0.32	0.060	3 / 81	5.36	YES
Iron	2.90 - 5.00	81 / 81	32,600	IS53SS260001	11,304	200	81 / 81	56.5	YES
Lead	0.50 - 1.00	81 / 81	31,200	IS53SS260001	999	50.0	63 / 81	20.0	YES
Manganese	0.040 - 0.070	81 / 81	713	IS53SS740001	187	330	10 / 81	0.57	NO
Mercury	0.040 - 32.0	76 / 80	962	IS53SD18	53.1	0.10	76 / 80	531	YES
Nickel	0.34 - 1.00	81 / 81	76.7	IS49SS010001	13.3	30.0	4 / 81	0.44	NO
Silver	0.26 - 0.44	61 / 81	19.6	IS53SS340001	1.00	2.00	8 / 81	0.50	NO
Thallium	0.78 - 1.10	16 / 81	2.50	IS53SD17	0.63	1.00	13 / 81	0.63	NO
Vanadium	7.00 - 12.0	80 / 81	38.2	IS53SS570001	23.1	2.00	80 / 81	11.6	YES
Zinc	0.010 - 0.14	81 / 81	6,000	IS53SS260001	451	50.0	70 / 81	9.02	YES
Semivolatile Organic Compounds (µg/kg)									
1,1-Biphenyl	340 - 560	1 / 20	58.0	IS53SS200001	189	NSV	-- / --	NSV	YES
2,4,5-Trichlorophenol	850 - 1,400	0 / 20	--	--	493	430	-- / --	1.15	(YES)
2,4-Dimethylphenol	340 - 560	0 / 20	--	--	197	100	-- / --	1.97	(YES)
2-Chlorophenol	340 - 560	0 / 20	--	--	197	100	-- / --	1.97	(YES)
2-Methylnaphthalene	340 - 560	1 / 20	140	IS53SS200001	193	NSV	-- / --	NSV	YES
2-Methylphenol	340 - 560	0 / 20	--	--	197	100	-- / --	1.97	(YES)
4-Nitrophenol	850 - 1,400	0 / 20	--	--	493	380	-- / --	1.30	(YES)
Acetophenone	340 - 560	4 / 20	260	IS53SS140001	186	NSV	-- / --	NSV	YES
Anthracene	330 - 560	7 / 20	2,900	IS53SS200001	302	100	4 / 20	3.02	YES
Benzaldehyde	340 - 560	3 / 20	420	IS53SS140001	200	NSV	-- / --	NSV	YES
Benzo(a)anthracene	340 - 4,000	16 / 20	7,700	IS53SS200001	658	100	12 / 20	6.58	YES
Benzo(a)pyrene	340 - 4,000	16 / 20	6,300	IS53SS200001	568	100	12 / 20	5.68	YES
Benzo(b)fluoranthene	340 - 4,000	16 / 20	9,100	IS53SS200001	800	100	13 / 20	8.00	YES
Benzo(g,h,i)perylene	340 - 560	14 / 20	1,700	IS53SS200001	211	100	5 / 20	2.11	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
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Table 6-19
Step 3A Screening - Laboratory Area Surface Soil
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Benzo(k)fluoranthene	340 - 560	13 / 20	2,800	IS53SS200001	350	100	7 / 20	3.50	YES
Butylbenzylphthalate	340 - 7,900	10 / 20	23,000	IS53SS010001	1,361	NSV	-- / --	NSV	YES
Carbazole	340 - 560	5 / 20	1,600	IS53SS200001	245	NSV	-- / --	NSV	YES
Chrysene	340 - 4,000	16 / 20	7,900	IS53SS200001	704	100	13 / 20	7.04	YES
Di-n-octylphthalate	340 - 560	1 / 20	170	IS53SS010001	195	NSV	-- / --	NSV	YES
Dibenz(a,h)anthracene	340 - 560	1 / 20	220	IS53SS200001	197	100	1 / 20	1.97	YES
Dibenzofuran	340 - 560	2 / 20	600	IS53SS200001	209	NSV	-- / --	NSV	YES
Fluoranthene	340 - 4,000	17 / 20	17,000	IS53SS200001	1,363	100	16 / 20	13.6	YES
Indeno(1,2,3-cd)pyrene	340 - 560	15 / 20	1,900	IS53SS200001	217	100	5 / 20	2.17	YES
Naphthalene	340 - 560	2 / 20	350	IS53SS200001	195	100	1 / 20	1.95	YES
Phenanthrene	330 - 4,000	16 / 20	13,000	IS53SS200001	949	100	11 / 20	9.49	YES
Pyrene	340 - 4,000	17 / 20	14,000	IS53SS200001	1,196	100	16 / 20	12.0	YES
bis(2-Ethylhexyl)phthalate	340 - 560	15 / 20	1,900	IS53SS010001	410	NSV	-- / --	NSV	YES
Explosives (µg/kg)									
2,4-Dinitrotoluene	340 - 840	4 / 81	7,300	IS53SS010001	386	NSV	-- / --	NSV	YES
2-Amino-4,6-dinitrotoluene	480 - 840	1 / 81	2,135	IS53SS060001	316	NSV	-- / --	NSV	YES
HMX	480 - 57,000	1 / 81	268,364	IS53SS330001	3,603	NSV	-- / --	NSV	YES
Nitrocellulose	1,500 - 4,300	22 / 80	75,000	IS53SD18	5,011	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
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Table 6-20
Step 3A Screening - Lab Area Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (µg/l)									
Aluminum	7.90 - 7.90	1 / 1	514	IS53SW01	514	87.0	1 / 1	5.91	YES
Copper	0.80 - 0.80	1 / 1	3.40	IS53SW01	3.40	2.85	1 / 1	1.19	YES
Cyanide	10.0 - 10.0	1 / 1	10.0	IS53SW01	10.0	5.20	1 / 1	1.92	YES
Iron	15.0 - 15.0	1 / 1	2,760	IS53SW01	2,760	320	1 / 1	8.63	YES
Lead	2.50 - 2.50	1 / 1	5.20	IS53SW01	5.20	0.54	1 / 1	9.55	YES
Manganese	0.20 - 0.20	2 / 1	1,300	IS53SW01	1,300	120	1 / 1	10.8	YES
Mercury	0.20 - 0.20	1 / 1	1.00	IS53SW01	1.00	0.91	1 / 1	1.10	YES
Silver	1.30 - 1.30	0 / 1	--	--	0.65	0.36	-- / --	1.81	(YES)
Semivolatile Organic Compounds (µg/l)									
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 1	--	--	12.5	2.30	-- / --	5.43	(YES)
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 1	--	--	5.00	1.50	-- / --	3.33	(YES)
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 1	--	--	5.00	0.30	-- / --	16.7	(YES)
Anthracene	10.0 - 10.0	0 / 1	--	--	5.00	0.73	-- / --	6.85	(YES)
Benzo(a)anthracene	10.0 - 10.0	0 / 1	--	--	5.00	6.30	-- / --	0.79	NO
Benzo(a)pyrene	10.0 - 10.0	0 / 1	--	--	5.00	0.014	-- / --	357	(YES)
Di-n-octylphthalate	10.0 - 10.0	0 / 1	--	--	5.00	3.00	-- / --	1.67	(YES)
Hexachlorobenzene	10.0 - 10.0	0 / 1	--	--	5.00	3.68	-- / --	1.36	(YES)
Hexachlorobutadiene	10.0 - 10.0	0 / 1	--	--	5.00	9.30	-- / --	0.54	NO
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 1	--	--	5.00	5.20	-- / --	0.96	NO
Pentachlorophenol	25.0 - 25.0	0 / 1	--	--	12.5	6.69	-- / --	1.87	(YES)
Phenanthrene	10.0 - 10.0	0 / 1	--	--	5.00	6.30	-- / --	0.79	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
WDC040230001.ZIP.KTM

Table 6-21
Step 3A Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (mg/kg)									
Arsenic	1.00 - 1.00	2 / 2	20.2	IS53SD14	12.1	8.20	1 / 2	1.47	YES
Beryllium	0.29 - 0.51	2 / 2	0.71	IS53SD14	0.54	NSV	-- / --	NSV	YES
Cyanide	0.72 - 1.26	0 / 2	--	--	0.50	0.10	-- / --	4.95	(YES)
Lead	1.00 - 1.00	2 / 2	82.8	IS53SD14	57.6	46.7	1 / 2	1.23	YES
Manganese	0.060 - 0.10	2 / 2	1,070	IS53SD14	779	460	2 / 2	1.69	YES
Mercury	1.00 - 2.00	2 / 2	24.5	IS53SD14	21.6	0.15	2 / 2	144	YES
Selenium	1.00 - 2.00	0 / 2	--	--	0.75	1.00	-- / --	0.75	NO
Silver	0.37 - 1.00	2 / 2	2.20	IS53SD14	1.32	1.00	1 / 2	1.32	YES
Vanadium	10.0 - 18.0	2 / 2	65.9	IS53SD14	45.2	57.0	1 / 2	0.79	NO
Zinc	0.010 - 0.030	2 / 2	189	IS53SD14	136	150	1 / 2	0.91	NO
Semivolatile Organic Compounds (µg/kg)									
2,4-Dimethylphenol	830 - 830	0 / 1	--	--	415	29.0	-- / --	14.3	(YES)
2-Methylnaphthalene	830 - 830	0 / 1	--	--	415	70.0	-- / --	5.93	(YES)
2-Methylphenol	830 - 830	0 / 1	--	--	415	63.0	-- / --	6.59	(YES)
Acenaphthene	830 - 830	0 / 1	--	--	415	16.0	-- / --	25.9	(YES)
Acenaphthylene	830 - 830	0 / 1	--	--	415	44.0	-- / --	9.43	(YES)
Anthracene	830 - 830	0 / 1	--	--	415	85.3	-- / --	4.87	(YES)
Benzo(a)anthracene	830 - 830	0 / 1	--	--	415	261	-- / --	1.59	(YES)
Benzo(a)pyrene	830 - 830	0 / 1	--	--	415	430	-- / --	0.97	NO
Benzo(g,h,i)perylene	830 - 830	0 / 1	--	--	415	670	-- / --	0.62	NO
Benzo(k)fluoranthene	830 - 830	0 / 1	--	--	415	240	-- / --	1.73	(YES)
Butylbenzylphthalate	830 - 830	0 / 1	--	--	415	63.0	-- / --	6.59	(YES)
Chrysene	830 - 830	0 / 1	--	--	415	384	-- / --	1.08	(YES)
Dibenz(a,h)anthracene	830 - 830	0 / 1	--	--	415	63.4	-- / --	6.55	(YES)
Dibenzofuran	830 - 830	0 / 1	--	--	415	540	-- / --	0.77	NO
Diethylphthalate	830 - 830	0 / 1	--	--	415	200	-- / --	2.08	(YES)
Dimethyl phthalate	830 - 830	0 / 1	--	--	415	71.0	-- / --	5.85	(YES)
Fluoranthene	830 - 830	0 / 1	--	--	415	600	-- / --	0.69	NO
Fluorene	830 - 830	0 / 1	--	--	415	19.0	-- / --	21.8	(YES)

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
WDC040230001.ZIP.KTM

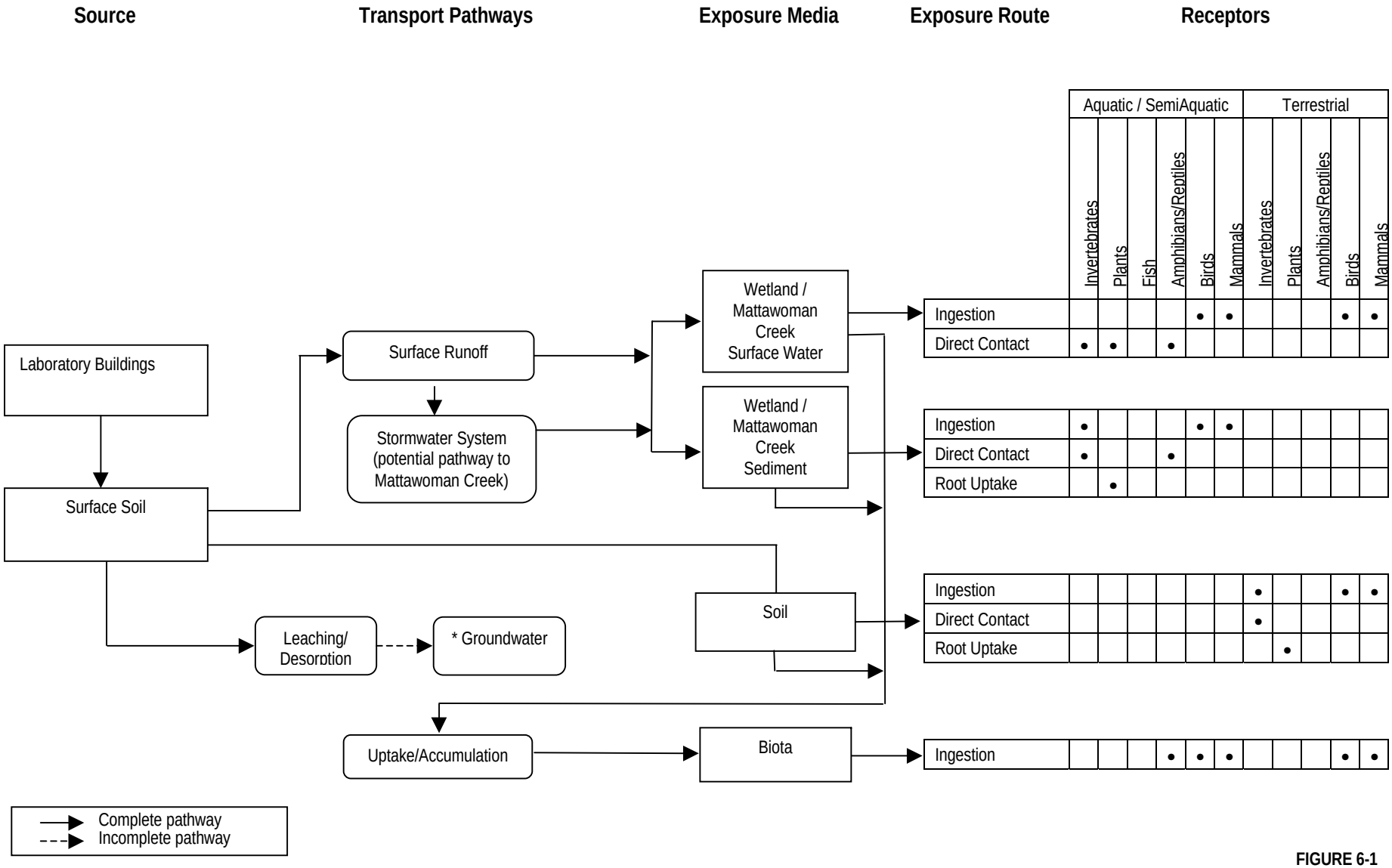
Table 6-21
Step 3A Screening - Lab Area Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Hexachlorobenzene	830 - 830	0 / 1	--	--	415	22.0	-- / --	18.9	(YES)
Hexachlorobutadiene	830 - 830	0 / 1	--	--	415	11.0	-- / --	37.7	(YES)
Indeno(1,2,3-cd)pyrene	830 - 830	0 / 1	--	--	415	600	-- / --	0.69	NO
Naphthalene	830 - 830	0 / 1	--	--	415	160	-- / --	2.59	(YES)
Pentachlorophenol	2,100 - 2,100	0 / 1	--	--	1,050	360	-- / --	2.92	(YES)
Phenanthrene	830 - 830	0 / 1	--	--	415	240	-- / --	1.73	(YES)
Phenol	830 - 830	0 / 1	--	--	415	420	-- / --	0.99	NO
Pyrene	830 - 830	0 / 1	--	--	415	665	-- / --	0.62	NO
n-Nitrosodiphenylamine	830 - 830	0 / 1	--	--	415	28.0	-- / --	14.8	(YES)

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
WDC040230001.ZIP.KTM

Table 6-22
Summary of Hazard Quotients for Food Web Exposures
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Chemical	White-footed mouse		Raccoon		Red fox		American robin		Red-tailed hawk	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	0.45	0.04	0.53	0.05	0.14	0.01	0.30	0.10	<0.01	<0.01
Cadmium	0.18	0.02	<0.01	<0.01	0.07	<0.01	2.14	0.16	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.50	0.30	0.07	0.01
Copper	0.08	0.06	0.02	0.01	0.08	0.06	0.30	0.23	<0.01	<0.01
Lead	0.55	0.06	0.03	<0.01	0.41	0.04	67.83	6.78	0.40	0.04
Mercury	29.98	6.00	2.19	1.32	1.57	0.94	31.18	15.59	0.27	0.13
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	0.05	<0.01	<0.01
Selenium	0.05	0.03	0.05	0.03	0.02	0.01	0.24	0.07	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.09	0.05	0.07	<0.01	0.39	0.04	16.82	1.86	0.40	0.04
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	NA	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-Phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.93	0.09	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



* Depth to groundwater is greater than 30 feet at the Laboratory Area

FIGURE 6-1
Preliminary Ecological Conceptual Model
Lab Area RI
NDWIH
Indian Head, Maryland

CH2MHILL

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SECTION 7

Summary, Conclusions, and Recommendations

7.1 Summary and Conclusions

This report describes the work performed for, and the results of, the RI conducted at the Lab Area at NDWIH, in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy, as CTO-0066 under U.S. Navy Contract N62470-95-D-6007.

The objectives of the RI were presented in the work plan (Brown & Root, 1997) and the site-specific work plan (CH2M HILL, 2001) as:

- Characterize the nature, extent, and concentrations of site-related contaminants in surface soil, subsurface soil, manhole and wetland sediments, and surface water, and determine the rate of migration of site-related contaminants in the environment;
- Remove the Chemical Disposal Pit at Site 49; and
- Identify actual or potential human or environmental receptors and potential contaminant migration pathways.

These objectives were accomplished with the specific activities for the Lab Area described in this RI report, including the Spring 2001 field investigation activities (i.e., surface and subsurface soil sampling, sewer sediment sampling, wetlands surface water and sediment sampling, and the removal of the Chemical Disposal Pit), as well as analysis of this data in terms of nature and extent, fate and transport, human health risk, and ecological risk in this RI report; however, ecological risk may have to be further evaluated.

7.1.1 Geology, Hydrogeology, and Nature and Extent of Contamination

The shallow geology of the site consists of fine- to medium-grained silty sand to a depth of approximately 4 feet. At this depth dense clay layer was encountered during the DPT activity. The lower limit of this clay layer was not encountered in borings advanced to depths of up to 16 ft-bgs during this RI. Previous investigations detailed that the clay layer extends from 4 to 40 ft-bgs (E/A&H), below which a medium- to fine-grained, reddish to white quartz sand, moderately cemented and very hard, marker bed was encountered during the 1992 SI (E/A&H, 1994). This marker bed was subsequently identified as the Tertiary Brandywine Formation, which is on top of the Patapsco Formation. Shallow groundwater has not been encountered at the site, and therefore, was not identified as a media/pathway for transport or exposure.

Field work for the Lab Area RI began on April 30, 2001, and concluded on May 25, 2001. The field investigation included surface soil sampling, subsurface pipe bedding soil sampling, sewer sediment sampling, wetlands surface water and sediment sampling, removing the Chemical Disposal Pit. The abandoned OWAP (Site 14) was discovered underneath the Chemical Disposal Pit.

In most instances, where analytical samples were collected, a full suite of analyses was performed. The full suite was comprised of TCL VOCs and SVOCs, TAL inorganics (i.e., metals and cyanide), and explosives (which also included NG, NQ, PETN, and perchlorate, in addition to the list of analytes included in USEPA SW-846 Method 8330).

Various constituents were detected throughout the Lab Area, the more prominent being NC, arsenic, lead, and mercury, among other inorganics and SVOCs. NC was not determined to be a risk, and was not observed to occur in any particular spatial pattern, other than occurring at higher concentrations in the surface soil at the topographic low sides of Buildings 102, 103, 108A, and 502.

With metals in general, the highest concentrations and the largest number of detections were encountered in samples collected around Buildings 102 and 103, and around other buildings in the eastern part of the Lab Area. This is likely due to storage and laboratory practices in these buildings and this portion of the site. Samples collected along the northwestern and northern portions of the site had among the lowest concentrations of metals, likely due to topography and laboratory density.

Arsenic, lead, and mercury were prominent throughout the Lab Area in the subsurface soil. Hot spots were identified around Manholes A and 471. Likely transport mechanisms for these constituents include releases from leaking underground sewer pipes and/or manholes, as well as infiltration and leaching from surface spills to about 4 ft-bgs.

Overall, sewer sediment samples demonstrated elevated levels of mercury, with some correlation to subsurface soil samples associated with the manholes, suggesting that mercury contamination in the subsurface soil occurred as a result of deteriorated piping and manhole connections. Mercury contamination was expected in the Lab Area due to the various laboratory activities involving mercury, and elevated levels above base-wide background are assumed site-related.

The emergent wetlands contained elevated levels of mercury, arsenic, lead, and some organics. The soil, sediment, and surface water analytical results were reviewed and used for screening against human-health and ecological screening criteria.

The Chemical Disposal Pit was removed, and confirmatory surface soil samples just outside the perimeter of the excavation, as well as the subsurface soil sample just below the excavation demonstrated no risk outside of USEPA's acceptable risk ranges to human or ecological receptors. Due to the co-location the Chemical Disposal Pit and the OWAP, data collected associated with the Chemical Disposal Pit were also considered representative of the OWAP, and results of this RI were considered sufficient to also document closure of the OWAP.

Based on the chemical and physical data gathered for the site and information provided by NDWIH, the following potential contaminant source areas have been identified or may exist at the site:

- Disposal in the former Chemical Disposal Pit of solutions of metals, organic solvents, and possibly other chemicals;
- Surface and subsurface soil contaminated by historic site operations disposal practices (e.g., physical dumping);

- Sewer sediment contaminated by site operations; and
- Emergent wetlands sediment contaminated by site operations;

Possible mechanisms for contaminant transport from the source areas at the site are:

- Precipitation causing erosion of surface soil from the site and deposition in emergent wetland sediments;
- Precipitation causing leaching of contaminants from the surface soil and transport by surface runoff to the emergent wetland;
- Precipitation causing leaching of contaminants from the surface soil to the shallow subsurface soil;
- Leaching of contaminants from the sewer to the subsurface soil through cracks in the underground pipes and manholes;
- Leaching of contaminants from the sewer to the wetland sediment and surface water through cracks in the underground pipe (line from I568 Pipe Valve to Manhole 471A) and from surrounding contaminated subsurface soil, due to break in underground freshwater pipe(s) in vicinity; and
- Transport of contaminated surface soil (or contaminants in the surface soil) into the air by wind erosion (or volatilization), and subsequent deposition.

Through careful review of the data and the conditions at the site, it was determined that precipitation causing leaching of contaminants from the surface soil to the subsurface soil, overland flow transport of constituents, and the volatilization of constituents (i.e., mercury) are the primary mechanisms of transport at the site.

7.1.2 Human Health Risks

Section 5 contains the baseline HHRA for the Lab Area. The HHRA was conducted to evaluate the potential human health risks associated with the presence of site-related surface soil, subsurface soil, surface water, and sediment contamination at the Lab Area. Potential risks were calculated for a current/future industrial worker, current/future other worker, current/future adult trespasser/visitor, current/future adolescent trespasser/visitor, current/future adult other recreational person, current/future child other recreational person, future adult resident, future child resident, future lifetime resident, and future construction worker. The baseline risk assessment was conducted to characterize the potential current and future human health risks at the Lab Area if no additional remediation is implemented.

No VOCs, SVOCs, or explosive compounds were found to represent a potential risk outside of USEPA's acceptable risk ranges to human receptors, either due to concentrations being lower than criteria, the absence of an exposure point, and/or the absence of a pathway or route of exposure.

No carcinogenic risks were calculated outside USEPA's acceptable risk range. Surface soil, subsurface soil, and emergent wetlands sediment were the only media that had noncarcinogenic hazards greater than the USEPA target levels. The main risk drivers for

these media were mercury (by incidental ingestion and inhalation) in surface and subsurface soil, and arsenic (by dermal contact) in the emergent wetlands sediment. Site-wide lead levels did not demonstrate a human health risk for lead; however, accounting for only the surface soil samples around Buildings 102, 103 and 304, lead was a potential health concern for hypothetical future small children residing near Buildings 102, 103 and 304, as well as current and adult industrial workers (and their unborn fetuses) through incidental ingestion and inhalation of surface soil.

7.1.3 Ecological Risks

Section 6 contains the ERA (i.e., SERA Steps 1 and 2, and BERA Step 3A). The ERA for the Lab Area determined an ecological risk for direct exposure to copper, lead, mercury, zinc, and some organics in soil; aluminum, copper, cyanide, iron, lead, manganese, and mercury in emergent wetland surface water; and arsenic, lead, manganese, mercury, and silver in emergent wetland sediment. Also, lead, mercury, and zinc all appeared to exhibit risk in the food chain for the American robin, white footed mouse, and/or raccoon.

Inorganics in soil and sediment (particularly mercury) are of greatest concern at the site, posing potential risks to soil invertebrates, sediment invertebrates, and upper trophic level receptors that have substantial direct contact with soils, or consume prey that have direct contact with soils. Food chain modeling also suggests that lead and zinc may pose risk through the food chain. Due to the high concentrations of mercury at the site, verification of the concentration of mercury in prey items is important for the top predators (e.g., red tailed hawk), even though food chain modeling showed minimal risk to this type of receptor.

Available data indicate that inorganic contamination, while generally highest near facility buildings upgradient of the emergent wetland, is distributed throughout much of the Lab Area. Wetland soil and stream channel samples collected downgradient of facility buildings suggest that inorganic contaminants have been transported into the emergent wetland, and potentially to Mattawoman Creek through the storm sewer system.

Although the distribution of organic COCs is not clearly defined, available data suggests that their occurrence may be a result of small, isolated releases. Relative to the inorganic contamination at the site, organics COCs are not expected to contribute significantly to ecological risk at the site.

As mentioned in Section 4.2.7, the emergent wetland is thought to be supported largely by potable water leaks. Two of these leaks were repaired since the RI field activities occurred, which may potentially reduce the size of the emergent wetlands. Regardless of the size or the presence of the emergent wetlands, risk to ecological receptors cannot be ruled out.

The ERA from the Draft Final RI Report recommended that additional risk assessment work be conducted to: (1) confirm with a greater level of certainty the risk posed by COCs (i.e., what COCs in what media pose a risk to what organism); and (2) more accurately define the spatial area over which those risk are present. Since the Draft Final RI was distributed, IHIRT and BTAG agreed on a path forward for the Lab Area (during the conference call on October 23, 2003).

The path forward included removing the impacted media in the emergent wetland and restoring the wetland. The removal PRGs will be based on literature-based PRGs to be

approved by BTAG via a Technical Memorandum and the removal and restoration will occur as part of the FS and/or EE/CA effort for the Lab Area upland surface soil (to be investigated further with the Lab Area Upland Soil BERA). Thus, potential risks to wetland receptors (i.e., water column invertebrates, amphibians, and omnivorous wetland mammals) will be removed once the wetland is restored. Therefore, further evaluation to refine the risk estimates associated with sediment COCs will not be conducted as part of the additional risk assessment work.

Further evaluation of potential ecological risk (i.e., a BERA) will be performed on the surrounding Lab Area surface soil, to (1) confirm with a greater level of certainty the risk posed by COCs, (2) more accurately define the spatial area over which those risks are present, and (3) support development of PRGs for possible subsequent soil removal if unacceptable risks are identified at the conclusion of the BERA.

7.2 Recommendations

All of the objectives established for the RI were met with this phase of work, except for entirely delineating the extent of ecological risk at the Lab Area. Therefore, additional RI sampling for additional definition of the nature and extent or human health risk assessment is not necessary.

Initial screening steps of the ecological risk assessment indicated that a more comprehensive ecological risk assessment would likely be necessary to more fully quantify the extent of ecological risk at the Lab Area. Therefore, IHIRT decided (during the time after distribution of the Draft Final RI Report) that the wetland area should be restored and a BERA should be performed for the upland soil portion of the Lab Area.

7.2.1 Restoration of the Wetland

IHIRT decided to remove the impacted media in the emergent wetland and restore the wetland to remove potential risks to wetland receptors (i.e., water column invertebrates, amphibians, and omnivorous wetland mammals). Therefore, a Technical Memorandum (to be approved by BTAG) will be prepared detailing literature-based PRGs for the contaminated wetland area soil/sediment, followed by an EE/CA for the wetland restoration.

7.2.2 BERA for Lab Area Surface Soil

IHIRT decided to continue with the remainder of the eight-step ERA process on the upland surface soil, because the SERA indicated there is a potential for site chemicals to pose a risk to ecological receptor populations. Therefore, a BERA Technical Memorandum and Work Plan will be developed to perform the BERA to (1) confirm with a greater level of certainty the risk posed by COCs, (2) more accurately define the spatial area over which those risks are present, and (3) support development of PRGs for possible subsequent soil removal if unacceptable risks are identified at the conclusion of the BERA.

7.2.3 Focused FS and/or EE/CA

Since risk to human and ecological receptors remains at the site, a FS will be performed to evaluate remedial alternatives; however, the FS will proceed after the BERA for the upland

soil in the Lab Area is completed. This will allow for selection of a remedial alternative that addresses both the human and [potential] ecological risks (pending the conclusion of the BERA for the upland soil). The RI indicates that risk to human health is driven by contamination in several "hot spots." Pending the conclusion of the BERA for the upland soil, there may also be defined hotspots that drive the ecological risk in the surface soil. Therefore, a Focused FS and/or EE/CA evaluating removal of these hot spots will be performed.

Appendix A
Sanitary Sewer Line Condition Survey Summary

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO60 – SO59 475B – 479A **NO SAMPLING PROPOSED IN THIS SEGMENT**	? / 8″	1976		Line was inaccessible due to chemical odor. Smoke passed through line during test. No repairs recommended
		1988	Sag: 12 through 83, 92 through 99, 114 through 157, 170 through 277 Cracked Joint: 167 Offset joint: 257	
		1998	@ MH-SO60: Root growth – None Deposition – None Structural condition – good Line/grade – good Visible infiltration – None Drop connection – No	Pipe Lined. Void in annular space, liner folded. No info @MH-SO59.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO60 – SO75 475B – 475A **NO SAMPLING PROPOSED IN THIS SEGMENT**	Vitrified Clay/10″	1976	MH-475B : 30 Drop in manhole : 25 MH-475A : 0	General condition of line is good. No repairs recommended
		1988	N/A	
		1998	@MH-SO60: Root growth – None Deposition – None Structural condition – poor Line/grade – sag Visible infiltration – None Drop connection – yes @MH-SO75: Root growth – none Deposition – 0.5″ sludge Structural condition – fair Line/grade – offset Visible infiltration – no Drop connection – no	

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO61 – SO60 472 – 475B **NO SAMPLING PROPOSED IN THIS SEGMENT**	Terra Cotta/12″	1976	MH-472: 281 Cracks: 200 Light roots at joint: 126 Drop into manhole: 6 MH-475B: 0	The pipe is cracked at 200′. Light roots at joint at 126′. Replacement of pipe from 200′ to 206′ and grouting of joint at 126′ is recommended.
		1988	Longitudinal cracked pipe: 5 through 7, 12 through 16 Offset joint: 72, 279, 281 Broken pipe: 87 through 94 Cracked joint: 96, 276 Hole in pipe: 107 Sag: 186 through 194 Drop connection: 280	
		1998	@MH-SO61: Root growth – None Deposition – None Structural condition – good Line/grade – good Visible infiltration – None Drop connection – no @MH-SO60: Root growth – none Deposition – none Structural condition – good Line/grade – good Visible infiltration – no Drop connection – no	Pipe Lined

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO62 – SO61 469 – 472 NO SAMPLING PROPOSED IN THIS SEGMENT	Terra Cotta/12″	1976	MH-469: 280 Beginning of crack: 235 End of crack: 230 Beginning of infiltration deposits at joints: 225 End of infiltration deposits at joints: 235 Possible light crack in crown: 54 Roots at joint: 47 Roots at joint: 44 Beginning of roots at joint: 40 End of roots at joint: 11 MH-472	Pipe is cracked from 235′ to 230′ and from 54′ to 47′. Appears to be infiltration deposits at joints from 225′ to 135′. There are roots at most joints from 47′ to MH-472
		1988	Cracked joint: 11, 39, 66, 109, 146, 192 Longitudinal cracked pipe: 25 through 29, 45 through 57 Mineral deposit (evidence of past infiltration): 64, 80, 82, 86, 90, 98, 116, 119, 150 Cracked pipe: 140 Offset joint: 221, 223, 243, 249 Sag: 223 through 229, 251 through 255	
		1998	@MH-SO62: Root growth – None Deposition – None Structural condition – good Line/grade – good Visible infiltration – None Drop connection – no @MH-SO61: Root growth – none Deposition – none Structural condition – fair Line/grade – good Visible infiltration – no Drop connection – yes	PVC liner installed from MH-SO62 towards MH-SO61. Liner is 8″ short of manhole, hence poor pipe seal. Fold in liner above the flowline.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO63 – SO62 467 – 469 NO SAMPLING PROPOSED IN THIS SEGMENT	Terra Cotta / 12″	1976		Line was inaccessible due to steam and chemical odors. During smoke test, smoke passed through line and came out of roof vent on Bldg. 600. No repairs are recommended.
		1988	Longitudinal cracked pipe: 2 through 28, 63 through 67, 85 through 89 Sag: 2 through 11 Mineral deposits (evidence of past infiltration): 35, 50, 53, 57, 63, 67, 73, 85 Cracked pipe: 42, 44	
		1998	@MH-SO62: Root growth – none Deposition – none Structural condition – good Line/grade – good Visible infiltration – no Drop connection – no	Pipe segment lined. Liner is 8″ short of MH-SO62, hence poor pipe seal. No info @ MH-SO63.
SO64 – SO63 468 – 467 NO SAMPLING PROPOSED IN THIS SEGMENT	Terra Cotta / 8″	1976		Pipe was inaccessible due to steam and chemical odors. Smoke passed through line during test and came out of roof vent on Bldg. 556.
		1988	Mineral deposits (evidence of past infiltration): 5, 7, 9, 11, 15, 21, 27, 32, 60, 66, 68 Cracked joint: 21, 30, 38, 56, 62, 66 Longitudinal cracked pipe: 39 through 40, 44 through 54 Broken pipe: 50 through 54, 68 through 75	
		1998		No info found.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO87 – SO62 466 – 469 SAMPLING PROPOSED IN THE FOLLOWING AREA: ENTIRE PIPE	Terra Cotta/8″	1976		Pipe was inaccessible due to steam. During smoke test, smoke passed through line. No repairs recommended.
		1988	Longitudinal cracked pipe: 2 through 4, 24 through 29, 32 through 36, 50 through 54, 58 through 74, 76 through 84 Cracked joint: 4, 20, 24, 36, 42, 50, 84, 89 Offset joint: 7, 32, 87 Broken pipe: 20 through 24, 58 through 63, 76 through 80	
		1998	@MH-SO62: Root growth – none Deposition – 4″ sand Structural condition – fair Line/grade – good Visible infiltration – no Drop connection – no	No info @MH-SO87
Bldg. 600 – SO87 Bldg. 600 – 466 NO SAMPLING PROPOSED IN THIS SEGMENT	?./ 8″?	1976		No info found.
		1988		No info found.
		1998		No info found.
Bldg. 600 – SO63 Bldg. 600 – 467 NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron./ 4″	1976		No info found.
		1988	Sag: 1, 17 Offset joint: 20	
		1998		No info found.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
Bldg. 556 – SO64 Bldg. 556 – 468 NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron / 4″	1976		No info found.
		1988	Offset joint: 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 Broken pipe: 14, 15 Mineral deposits (evidence of past infiltration): 14, 17, 18 Sag: 14, 18	
		1998		No info found.
Bldg. 556A – SO64 Bldg. 556A – 468 NO SAMPLING PROPOSED IN THIS SEGMENT	Vitrified Clay / 6″	1976		
		1988	Offset joint: 3, 4, 5, 7, 8, 9, 10, 12, 13, 16, 18, 28, 30, 34, 35, 40 Service connection: 6, 8, 17, 29 SJ: 9, 15	
		1998		No info found.
Bldg. 556B – SO64 Bldg. 556B – 468 NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron / 4″	1976		No info found.
		1988	Service connection: 4, 7 Broken pipe: 10	
		1998		No info found.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
Bldg. 556C – SO64 Bldg. 556C – 468 NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron / 4″	1976		No info found.
		1988	Offset joint: 15, 25, 30	
		1998		No info found.
Bldg. 101 – SO62 Bldg. 101 – 469 NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron / 4″	1976		No info found.
		1988	Offset joint: 6, 9, 12, 17, 22, 27, 32, 37	
		1998	@MH-SO62: Root growth – none Deposition – 4″ sand Structural condition – good Line/grade – good Visible infiltration – no Drop connection – no	4″ lateral was leaking dye from floor above manhole.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO94 – SO81 ? – 471 NO SAMPLING PROPOSED FOR THIS PIPE SEGMENT	? / 8″	1976		No info found.
		1988		No info found.
		1998	@MH-SO81: Root growth – none Deposition – none Structural condition – ? Line/grade – ? Visible infiltration – ? Drop connection – ?	Line blocked upstream of SO81. Could not enter manhole because of slab size. No info @MH-SO94
SO81 – SO80 471 – 471A NO SAMPLING PROPOSED IN THIS SEGMENT	?. / 6″	1976		No info found.
		1988	Roots: 23, 24, 28, 29, 35, 36, 38, 42, 45, 48, 52 Hole in pipe: 38 Mineral deposits (evidence of past infiltration): 51	
		1998	@MH-SO81: Root growth – none Deposition – none Structural condition – fair Line/grade – good Visible infiltration – no Drop connection – no	No info @ MH-SO80

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO82 – SO81 "A" – 471 SAMPLING PROPOSED FOR THE ENTIRE PIPE SEGMENT	Terra Cotta/6"	1976		No info found.
		1988	Roots: 7, 15, 21, 25, 29, 37, 39, 52, 56, 60, 63, 65, 66, 68, 70, 72, 74, 76, 82, 84, 86, 88, 90, 93, 95, 97, 99, 103, 105, 107, 113 Mineral deposits (evidence of past infiltration): 33 Cracked joint: 47, 52, 72, 93, 100, 103 Offset joint: 109, 111, 113, 115	1 lb of Hg found in MH-SO82 in 1989
		1998	@MH-SO81: Root growth – none Deposition – none Structural condition – ? Line/grade – ? Visible infiltration – ? Drop connection – ?	No info found @MH-SO82. Could not enter MH-SO81 because of slab size.
SO81 – ? 471 – ? NO SAMPLING PROPOSED FOR PIPE SEGMENT	Cast iron/4"	1976		No info found.
		1988		No info found.
		1998	@MH-SO81: Root growth – none Deposition – none Structural condition – poor Line/grade – good Visible infiltration – ? Drop connection – ?	Do not know where this pipe comes from.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
SO81 – ? 471 – ?NO SAMPLING PROPOSED FOR PIPE SEGMENT	Terra Cotta/6″	1976		No info found.
		1988		No info found.
		1998	@MH-SO81: Root growth – none Deposition – none Structural condition – poor Line/grade – good Visible infiltration – ? Drop connection – ?	Do not know where this pipe comes from.
SO80 – SO61 471A – 472 NO SAMPLING PROPOSED FOR PIPE SEGMENT	Vitrified clay/8″	1976		The general condition of the line is good. No repairs are recommended.
		1988	Cracked joint: 29 Sag: 35 through 50, 147 through 151 Hole in pipe: 127	
		1998	@MH-SO61: Root growth – none Deposition – none Structural condition – fair Line/grade – good Visible infiltration – no Drop connection – yes	No info @ MH-SO80.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
Bldg. 444 – SO61 Bldg. 444 – 472 NO SAMPLING PROPOSED FOR PIPE SEGMENT	Vitrified clay/6″	1976		No info found.
		1988	Offset joint: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 Sag: 4, 7, 19, 38 Mineral deposits (evidence of past infiltration): 45 Broken pipe: 51	
		1998	@MH-SO61: Root growth – none Deposition – none Structural condition – good Line/grade – good Visible infiltration – no Drop connection – yes	This service connection was described as a 3″ plastic pipe. This may have replaced the original 6″ V.C pipe, or the pipe may be lined.
SO83 – SO82 ? - ? SAMPLING PROPOSED FOR THE FOLLOWING AREAS: 6′ 18′ 42′ –49′	Terra Cotta/6″	1976		No info found.
		1988	Offset joint: 6, 18 Cracked pipe: 42 Roots: 42, 52 Cracked joint: 49	Information incomplete. Xerox cut off. 1 lb of Hg found in MH-SO82 in 1989
		1994		81.4 mg/kg of Hg detected in sediments in MH-SO83.
		1998		No info found.

TABLE A-1
SANITARY SEWER LINE CONDITION SURVEY SUMMARY
SITE 53 – MERCURY CONTAMINATION OF THE SEWAGE SYSTEM
INDIAN HEAD, MARYLAND

LINE SEGMENT	TYPE / DIA.	DATE OBSERVED	DEFECT: FOOTAGE	COMMENTS
Bldg. 102 – SO82 Bldg. 102 - ? NO SAMPLING PROPOSED IN THIS SEGMENT	Vitrified clay / 6″	1976		No info found.
		1988	Offset joint: 2, 4, 6, 8, 10, 12, 15, 17, 18, 21, 24, 27, 30, 33, 48 Broken pipe: 15, 17 Sag: 17, 29 Service connection: 22	1 lb of Hg found in MH-SO82 in 1989
		1998		No info found.
Bldg. 102A – SO82 Bldg. 102A - ? NO SAMPLING PROPOSED IN THIS SEGMENT	PVC / 4″	1976		No info found.
		1988	Sag: 60 Service connection: 98	1 lb of Hg found in MH-SO82 in 1989
		1998		No info found.
Bldg. 102 – SO83 Bldg. 102 - ? NO SAMPLING PROPOSED IN THIS SEGMENT	Cast iron / 4″	1976		No info found.
		1988	Sag: 1, 9 Offset joint: 10, 12, 15, 20 Cracked pipe: 14 Mineral deposits (evidence of past infiltration): 15 Service connection: 22	Info incomplete. Xerox cut off
		1994		81.4 mg/kg of Hg detected in sediments of MH-SO83.
		1998		No info found.

REFERENCES:

1976: Robinson Pipe Cleaning Co. closed circuit TV inspection logs.

1988: RJN Group video pipe condition survey (annotated figure).

1994: Site Inspection Report

1998: Infiltration and Inflow Investigation for Wastewater Collection System, RJN Group, 1998.

STORM SEWER LINE CONDITION SURVEY SUMMARY:

Not one of the line segment/manhole condition survey reports (1976, 1988, & 1998) contained any information pertaining to the condition of the storm sewer line segments and/or manholes. It is assumed that the focus of these reports was strictly on the sanitary lines. However, the Preliminary Assessment Report states that approximately 10 lbs of mercury was recovered in 1969 from the manhole that receives storm lines from Bldgs. 102, 103, 1746, and 502. This manhole can be identified as the first upstream manhole from MH-474 (not to be confused with MH-473). Additionally, the Site Inspection Reported (1994), states that approximately 52.0 mg/kg of mercury was detected in the sediments of this same manhole, and 2.5 mg/kg of mercury was detected in the sediments of MH-473. MH-473 is located downstream of the chemical disposal pit north of Bldg. 444. No further information on the storm sewer lines is available at this time.

Appendix B
Sewage Plant Sludge Analysis, 1987-1999

File for Site 53

5090
Ser 0431G/94/mkf
03 Feb 89

MEMORANDUM

From: 0431G
To: 0431

Subj: EVALUATE OFF-STATION WASTE ANALYSIS - ENVIRONMENTAL TASK TEAM CONCERN NUMBER C1

Encl: (1) Details On Sewage Plant Sludge Analyses - Quotes

1. Presently, we are experiencing a mercury contamination problem on the sludge, as described below:

a.

SAMPLE IDENTIFICATION	TOTAL MERCURY (DRY BASIS)
1987 Sludge	25 mg/kg
1988 Sludge	150 mg/kg(CL)
	172 mg/kg(CL)
Soil from 1988 application	90.2 mg/kg(CL)
	101 mg/kg(VL)

NOTE: Abbreviations (CL) and (VL) stand for Chesapeake Laboratory and Versar Laboratory, respectively.

b. Because of high mercury content, the sludge does not qualify as class I sewage sludge, COMAR 10.17.10. The limit on mercury is 10 mg/kg.

2. For safety of personnel handling the sludge (and also from possible legal point of view), we need to document that the sludge is not a hazardous waste. EP-toxicity test is the basis, in this case, to determine the sludge as non-hazardous or hazardous.

3. Once the mercury contamination problem is solved satisfactorily, the next step is to determine if the sludge qualifies as class I sewage sludge. Analyses requirements for this type of sludge are given below. Concentration figures are the maximum allowed. Analyses should be on dry weight basis.

a.

CONSTITUENT	CONCENTRATION (Parts per million)
cadmium	25
copper	1000
mercury	10
nickel	200
lead	1000
zinc	2500
PCB's	10

Subj: EVALUATE OFF-STATION WASTE ANALYSIS - ENVIRONMENTAL TASK TEAM CONCERN NUMBER C1

b. For any off-site disposal of sludge, the above analyses are required. It is a permit requirement (once we decide to have one). In the meantime, next sludge discharge to sand beds is expected around April, 1989.

4. Various analytical laboratories approved for environmental analyses in the general area are contacted. Quotations are obtained regarding costs for various analyses. Quotes for normal turnaround versus five-working-day special are tabulated.

T. K. TUMMALA

Copy to:
043C2

CHESAPEAKE ANALYTICAL LABORATORY, INC.
P.O. Box [illegible] [illegible]
Phone: (301) [illegible]

November 10, 1989

Mr. John Tominack
NAVORDSTA
Indian Head, MD 20640

Dear Mr. Tominack:

Listed below are results of analyses performed on a sample of sludge taken from sanitary waste treatment sludge drying beds at NAVORDSTA.

Sample Identification: SS01 Sewage Sludge (from dumpster)
Sampler's Name: J. Tominack
Sample Date: 10/12/89 Sample Time: 0930
Received in Lab: 10/17/89

PARAMETER	EPA METHOD	ANALYSIS DATE	WET-WGT MG/KG	DRY-WGT MG/KG	ANALYST
pH	150.1	10/23/89	6.7		Knott
% Solids	209F*	10/23/89	93.6 per cent		Knott
NO3-N	353.1	11/08/89	27.6	29.5	Knott
NH3-N	350.1	11/09/89	665	710	Knott
Total N	(353.1 + 351.2)		17600	18800	Knott
Total P	365.1	11/09/89	13200	14100	Knott
Cadmium	213.1	10/23/89	16.2	17.2	Lufriu
Chromium	218.1	N/A			
Copper	220.1	10/23/89	625	665	Lufriu
Mercury	245.1	10/23/89	40	43	Lufriu
Nickel	249.1	10/23/89	35.7	38.0	Lufriu
Lead	239.1	10/23/89	186	197	Lufriu
Zinc	289.1	10/23/89	1400	1480	Lufriu
Potassium	258.1	10/23/89	3200	3410	Lufriu

*Standard Methods, 16th ed.
Sludge was digested for metals, except mercury, using SW-846, Method 3050.

All analyses were performed according to EPA approved procedures. Please feel free to call me if you have any questions about these analyses.

Sincerely,

Ted W. Lufriu
Lab Director

ENCLOSURE(1)

CHESAPEAKE ANALYTICAL LABORATORY, INC.
P.O. Box 2780 · Indian Head, Maryland 20640
Phone: (301) 934-2639

June 13, 1990

Mr. Thomas Woo
NAVORDSTA, Public Works
Indian Head, MD 20640

Dear Mr. Woo:

Listed below are results of analyses performed on samples of sludge taken from the sanitary waste treatment plant at NAVORDSTA. All results listed as mg/Kg (wet-wt and dry-wt basis) except pH and % Solids. Not all analyses have been completed as of this date. You will receive a complete report as soon as possible. Analyses listed as "greater than" (>) will be retested in order to determine exact concentrations.

Sample Date: 05/30/90 Sample Time: 1100
Received in Lab: 05/30/90

Sample ID:	"Old Bed"		"New Bed"		Thickener		Digestor	
PARAMETER	wet	dry	wet	dry	wet	dry	wet	dry
pH	6.9	---	7.0	---				
% Solids	49.2	---	52.7	---				
NO3-N	392	797	106	201				
NH4-N	448	911	451	856				
Total P	8460	17200	8940	17000				
Cadmium								
Copper								
Mercury	28.5	57.9	42.6	80.8	>0.08	>2	>0.08	>3
Nickel								
Lead								
Zinc								
Potassium								
PCB								

Sludge was digested for metals, except mercury, using SW-846, Method 3050.

All analyses were performed according to EPA approved procedures. Please feel free to call me if you have any questions about these analyses.

Sincerely,

Ted W. Lufrku
Lab Director

ENCLOSURE(2)

July 24, 1990

Mr. Peter Ritzcovan
Director, Environmental Protection Division
Naval Ordnance Station
Indian Head, Maryland 20640-5000

Dear Mr. Ritzcovan:

This is in response to your letter of June 19, 1990. After consultation with our contractor regarding your request, this is to advise that Charles County does not wish to jeopardize its land application program. The level of mercury in your sludge is more than four times the allowable limit for sludge to be land applied in Maryland. If after pretreatment, you can get the level down to below 10 ppm on a dry weight basis and meet Department of Agriculture standards for land application of sludge, we could accept your sludge for disposal.

Should you have any questions, please contact me at either of the numbers shown below.

Sincerely,

Susan C. Weber, P.E.
Environmental Resources Director

pc: Mel Bridgett
Roy Hancock
Mike Mudd

SW:mea

7-27-90

DEPARTMENT OF THE NAVY
NAVAL ORDNANCE STATION
INDIAN HEAD, MARYLAND 20640-5000

5090
Ser 0964/633
9 Oct 91

Maryland Department of the Environment
Sewage Sludge Division
Attn: Mr. Douglas Proctor
2500 Broening Highway
Baltimore, MD 21224

Gentlemen:

Our annual Sludge Analysis Report for 1991, as required by Code of Maryland Regulations 26.04.13, is provided as enclosure (1). The sludge is from our sewage plant covered under National Pollutant Discharge System (NPDES) permit MD0020885. If you have any questions, please contact Mr. Michael Dunn on (301) 743-6747.

Sincerely,

KENNETH D. MORIN, P.E.
Director, Utilities/
Environmental Division
By direction of
the Commanding Officer

Encl:
(1) Sludge Analysis Report
For 1991

(Please read instructions on the back)

Report Submital Date:

OFFICE USE ONLY
Generator ID:

)Name of Sludge Generator

NAVAL ORDNANCE STATION, Indian Head, MD

)Sample Date: 8/14/91

)Sample Type: GRAB or (COMPOSITE)

)Sample Number: SS01 Drying beds

)Moisture Content: 8.5%

Date Received:

)Sludge Type (See Back): 02 Aerobically Digested

)Lab Name Lab Phone

Chesapeake Analytical Laboratory (301) 932-4775

Lab Number:

)Results of Analysis (continue on another page, if necessary)

a)Parameter Analyzed	OFFICE USE Parm Code	b)Value Dry Weight	c)Units	d) < Detection Limit(Y/N)
Cadmium	CD	8.03	mg/kg	N
Copper	CU	382	mg/kg	N
Lead	PB	97.4	mg/kg	N
Mercury	HG	23.5	mg/kg	N
Nickel	NI	44.8	mg/kg	N
Zinc	ZN	831	mg/kg	N
PCBs	PCB	<0.3	mg/kg	Y
Total Kjeldahl N	TKN	20,700	mg/kg	N
Ammonium Nitrogen	NH4	770	mg/kg	N
Nitrate Nitrogen	NO3	28.5	mg/kg	N
Total Phosphorous	TP	1,170	mg/kg	N
Total Potassium	TK	2,880	mg/kg	N
pH	PH	6.4		N/A

)Certification As an authorized representative of the above named sewage sludge generator, I certify that the above information is correct and complete to the best of my knowledge.

a)Name

KENNETH D. MORIN, P.E.

b)Title

Director, Utilities/Environmental Division

c)Signature

Kenneth D. Morin

d)Date 10/3/91

ENCLOSURE(1)

REPORT OF ANALYSIS

Report Date: 08/20/93
Sample Source: NSWC - Indian Head Division
Indian Head, MD 20640
Contact Person: Jim Pinto, (301) 743-4320
Sample Identification: WWTP Drying Bed Sludge
Sample Date/Time: ~~07/22/93, 1535~~
Received in Lab: 07/22/93

PARAMETER	EPA METHOD	ANALYSIS DATE	WET-WGT mg/Kg	DRY-WGT mg/Kg	ANALYST
pH	150.1	08/17/93	7.5 pH units		RM
% Solids	2540G	07/22/93	89.0 per cent		CM
% Vol.Solids	160.4	08/12/93	56.0 per cent		RM
TKN	351.2	08/10/93	35600	40000	ES
NH3-N	350.1	08/18/93	861	967	ES
NO3/NO2-N	353.1	07/29/93	56.7	63.7	ES
NO2-N	353.1	08/04/93	9.43	10.6	ES
NO3-N	353.1	07/29/93	47.3	53.1	ES
Total P	365.1	08/06/93	17200	19300	ES
Total N	353.1 & 351.2	CALCULATED	35700	40100	ES
TPH	418.1	08/09/93	650	730	TL
Potassium	258.1	08/06/93	2100	2400	ES
Cadmium	213.1	08/06/93	7.95	8.94	ES
Copper	220.1	08/06/93	564	634	ES
Mercury	245.5	08/19/93	9.9	11	ES
Nickel	249.1	08/06/93	32.5	36.6	ES
Lead	239.1	08/06/93	98.1	110	ES
Zinc	289.1	08/06/93	947	1060	ES
Chromium	218.1	08/03/93	29.4	33.0	ES
Arsenic	206.2	08/12/93	1.49	1.68	ES
PCB*	8080	08/14/93	<0.2	<0.23	TL

*Detection limit is for Arochlor 1254. Analysis was performed by gas chromatography/electron capture detector. Sample was extracted 07/28/93 by extraction method 3510.

Sludge was digested for metals, except mercury, using SW-846, Method 3050.

Laboratory Director: Debra L. Everett for Ted W. Lupin Date: 8/20/93

ENCLOSURE(2)

DEPARTMENT OF THE NAVY
INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER
101 STRAUSS AVE
INDIAN HEAD MD 20640-5035

5090
Ser 045G/209
11 Sept 96

Dr. Hedy V. Alavi
Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

Dear Dr. Alavi:

We are submitting to you our annual sewage sludge analysis data for calendar year 1996. If you have any questions regarding the data, please contact Mr. Michael Snyder of my staff on (301) 743-4320.

Sincerely,

MICHAEL W. DUNN
Director, Air, Water, & Natural
Resources Management Division
By direction of the Commander

Encl:
(1) Sanitary Sludge Data
Report for 1996
(2) Laboratory Report

Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway, Baltimore, Maryland 21224

Sewage Sludge Analysis Report

1. Name of Sludge Generator: INDIAN HEAD DIVISION NAVAL SURFACE WARFARE CENTER

2. Sample Date: 06/17/96 **3. pH** 7.4

4. Sample Type: ☐ Grab ☒ Composite **5. Solids Content** 94.7%

6. Sludge Type: ☐ Raw, Unstabilized ☒ Aerobically Digested
☒ Air Dried ☐ Composted ☐ Lime Stabilized ☐ Anaerobically Digested
☐ Other (Describe):

7. Laboratory Name: CHESAPEAKE ANALYTICAL LABORATORY, INC.

8. Results of Analysis: * Optional **Lime Amended Sludges

Parameter Analyzed		Value (WET WGT.)	Units	Detection limit
Total Phosphorus	TP	15,600	mg/kg	0.05
Total Potassium	TK	1,986	mg/kg	0.1
Total Kjeldahl Nitrogen	TKN	99.98	%	0.5
Ammonium Nitrogen	NH_4	12.82	%	0.5
Nitrate Nitrogen	$N0_3$	7.59	mg/kg	0.05
Cadmium	Cd	8.28	mg/kg	0.010
Copper	Cu	540	mg/kg	0.050
Nickel	Ni	42.65	mg/kg	0.100
Lead	Pb	124.4	mg/kg	0.100
Zinc	Zn	1120	mg/kg	0.005
Mercury	Hg	5.10	mg/kg	0.0005
*Arsenic	As	9.558	mg/kg	0.005
*Molybdenum	Mo	----	mg/kg	----
*Selenium	Se	----	mg/kg	----
PCBs	PCB	0.20	mg/kg	0.050
**Calcium Carbonate Equivalent	$CaC0_3$	----		----

Certification: As an authorized representative of the above named sewage sludge generator, I certify that the above information is correct and complete to the best of my knowledge.

Name: MICHAEL W. DUNN **Title:** DIRECTOR, AIR, WATER AND NATURAL RESOURCES DIVISION

Signature: Michael W. Dunn **Date:**

Phone: (301) 743-4320

Attach a copy of Laboratory Report

rev. 3/96

ENCLOSURE(7)

CHESAPEAKE ANALYTICAL LABORATORY, INC.
106A Rockefeller Court, Waldorf, MD 20602
(301) 932-4775

REPORT OF ANALYSIS

Report Date: July 5, 1996
Client Name: NSWC, Indian Head Division
Indian Head, MD 20640-5000
Contact Person: Frank Hannah, (301) 743-4320
Sample Source: Sanitary Sludge
Sample Received: 06/19/96, 1410

SAMPLE INFORMATION:

Sample ID	Date	Time	Preserv.	Type
SS-01-06-96 Sanitary Sludge	06/17/96	1300	4C	Grab

ANALYTICAL RESULTS:

pH: 7.4 units
% Solids: 94.7 per cent
% Volatile Solids: 49.6 per cent

Parameter	mg/kg Wet Weight	mg/kg Dry Weight
TKN	36900	39000
NH3-N	4730	5000
NO3-N	7.59	8.01
Total N	36908	39000
Total P	15600	16500
As	9.558	10.09
Cd	8.28	8.74
Cr3	33.9	35.8
Cu	540	570
Hg	5.10	5.39
Pb	124.4	131.4
Ni	42.65	45.04
K	1986	2097
Ag	50.37	53.19
Zn	1120	1180
Tl.i	1080	1140
PCB	<0.20	<0.21

ENCLOSURE(2)

ANALYTICAL INFORMATION:

Parameter	Method	Prep Date	Analysis Date	Analyst
pH	150.1		06/20/96	LD
% Solids	160.3		06/24/96	KH
% Volatile Solids	160.4		06/24/96	KH
TKN	351.2	07/02/96	07/02/96	TL/KH
NH3-N	350.1	07/03/96	07/03/96	TL/KH
NO3-N	353.2		06/27/96	TL
Total N	353.2 + 351.2		CALCULATION	
Total P	365.1	06/27/96	06/27/96	TL/KH
As	206.2	06/27/96	06/28/96	DK
Cd	213.1	06/27/96	07/01/96	DK
Cr	218.1	06/27/96	07/03/96	DK
Cu	220.1	06/27/96	07/01/96	DK
Pb	239.1	06/27/96	07/02/96	DK
Hg	245.5	06/28/96	06/28/96	DK
Ni	249.1	06/27/96	07/02/96	DK
K	258.1	06/27/96	07/02/96	DK
Ag	272.1	06/27/96	07/02/96	DK
Zn	289.1	06/27/96	07/01/96	DK
TPH	418.1		06/22/96	DK
PCB	8080	06/24/96	06/26/96	DK

NOTE: Sample was digested for metals, except mercury, using EPA Method 3050.
Sample was extracted for PCB analysis using EPA Method 3510.
All analyses performed using EPA approved procedures.

Reviewed and approved: Ted W [illegible]. Date: 07/05/96.
Lab Director

Filename: R960619.SSS

DEPARTMENT OF THE NAVY
INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER
101 STRAUSS AVE
INDIAN HEAD MD 20640-5035

5090
Ser 045J/190
18 Sept 97

Dr. Hedy V. Alavi
Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

Dear Dr. Alavi:

We are submitting to you our annual sewage sludge analysis data for calendar year 1997. If you have any questions regarding the data, please contact Mr. Jim Humphreys of my staff on (301)743-6745.

Sincerely,

MICHAEL W. DUNN
Director, Air, Water, & Natural
Resources Management Division
By direction of the Commander

Encl:
(1) Sanitary Sludge Data
Report for 1997
(2) Laboratory Report

Waste Management Administration
2500 Broening Highway, Baltimore, Maryland 21224

Sewage Sludge Analysis Report

1. Name of Sludge Generator: INDIAN HEAD DIVISION NAVAL SURFACE WARFARE CENTER

2. Sample Date: 08/13/97

3. pH 7.0

4. Sample Type: ☐ Grab ☒ Composite

5. Solids Content 91.6%

6. Sludge Type: ☐ Raw, Unstabilized ☒ Aerobically Digested ☒ Air Dried ☐ Composted ☐ Lime Stabilized ☐ Anaerobically Digested ☐ Other (Describe):

7. Laboratory Name: CHESAPEAKE ANALYTICAL LABORATORY, INC.

8. Results of Analysis: * Optional **Lime Amended Sludges

Parameter Analyzed		Value (WET WGT.)	Units	Detection limit (MG/L)
Total Phosphorus	TP	17,300	mg/kg	0.05
Total Potassium	TK	1,850	mg/kg	0.1
Total Kjeldahl Nitrogen	TKN	3.20	%	0.5
Ammonium Nitrogen	NH_4	0.42	%	0.1
Nitrate Nitrogen	NO_3	3.16	mg/kg	0.05
Cadmium	Cd	5.83	mg/kg	0.010
Copper	Cu	454	mg/kg	0.050
Nickel	Ni	34.8	mg/kg	0.100
Lead	Pb	108.2	mg/kg	0.100
Zinc	Zn	1,070	mg/kg	0.005
Mercury	Hg	4.14	mg/kg	0.0005
*Arsenic	As	2.03	mg/kg	0.005
*Molybdenum	Mo	———	mg/kg	———
*Selenium	Se	———	mg/kg	———
PCBs	PCB	0.46	mg/kg	2.0 (MG/KG)
**Calcium Carbonate Equivalent	$CaCO_3$			

Certification: As an authorized representative of the above named sewage sludge generator, I certify that the above information is correct and complete to the best of my knowledge.

Name: MICHAEL W. DUNN

Title: DIRECTOR, AIR, WATER AND NATURAL RESOURCES DIVISION

Signature: Michael W. Dunn

Date: 09/22/97

Phone: (301) 743-4320

Attach a copy of Laboratory Report

rev. 3/96

ENCLOSURE(1)

100A Rockefeller Court, Rockville, M
(301) 932-4775

9/28/97

REPORT OF ANALYSIS

Report Date: September 23, 1997
(Revision of report dated September 17, 1997)
Client Name: NSWC, Indian Head Division
Indian Head, MD 20640-5000
Contact Person: Frank Hannah, (301) 743-4320
Sample Source: Sanitary Sludge
Sample Received: 08/13/96, 1320

Revision done as per Mike Snyder to reflect addition of NO3/NO2-N to Total N value.

SAMPLE INFORMATION:

Sample ID	Date	Time	Preserv.	Type
SS-08-13-96 Sanitary Sludge	08/13/97	1100	4C	Grab

ANALYTICAL RESULTS:

pH: 7.0 units
% Solids: 91.6 per cent
% Volatile Solids: 42.3 per cent

Parameter	mg/kg Wet Weight	mg/kg Dry Weight
TKN	32000	35000
NH3-N	4230	4620
NO3/NO2-N	7.40	8.08
NO2-N	4.24	4.63
NO3-N	3.16	3.45
Total N	32007	35008
Total P	17300	18800
As	2.03	2.22
Cd	5.83	6.37
Cr3	36.5	39.9
Cu	454	496
Hg	4.14	4.52
Pb	108.2	118.1
Ni	34.8	38.0
K	1850	2020
Ag	45.54	49.72
Zn	1070	1160
TPH	480	520
PCB	<0.46	<0.50

ENCLOSURE(2)

ANALYTICAL INFORMATION:

Parameter	Method	Prep Date	Analysis Date, Time	Analyst
pH	150.1		08/13/97, 1535	KL
% Solids	160.3		08/14/97	KL
% Volatile Solids	160.4		08/14/97	KL
TKN	351.2	09/02/97	09/02/97	KH
NH3-N	350.1	09/08/97	09/09/97	KH
NO3/NO2-N	353.2		09/03/97	KH
NO2-N	353.2		09/03/97	KH
NO3-N	(NO3/NO2-N)-NO2-N		CALCULATION	
Total N	353.2 + 351.2		CALCULATION	
Total P	365.1	08/19/97	08/19/97	KH
As	206.2	08/28/97	09/12/97	DK
Cd	213.1	08/28/97	09/16/97	DK
Cr	218.1	08/28/97	09/16/97	DK
Cu	220.1	08/28/97	09/16/97	DK
Pb	239.1	08/28/97	09/16/97	DK
Hg	245.5	08/19/97	08/19/97	DK
Ni	249.1	08/28/97	09/16/97	DK
K	258.1	08/28/97	09/16/97	DK
Ag	272.1	08/28/97	09/16/97	DK
Zn	289.1	08/28/97	09/16/97	DK
TPH	418.1		09/10/97	KH
PCB	8080	08/20/97	09/02/97	TL

NOTE: Sample was digested for metals, except mercury, using EPA Method 3050.
Sample was extracted for PCB analysis using EPA Method 3510.
All analyses performed using EPA approved procedures.

Reviewed and approved: Debra L. Scott. Date: 09/23/97.
Lab Supervisor

Filename: R970813.SSS

DEPARTMENT OF THE NAVY
INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER
101 STRAUSS AVE
INDIAN HEAD MD 20640-5035

5090
Ser 045J/237
23 Dec 98

Ms. Elaine Nolen
Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

Dear Ms. Nolen,

We are submitting to you our annual sewage sludge analysis data for calendar year 1998. The Sewage Sludge Utilization Permit number for this activity is S-98-30-3483-E.

If you have any questions regarding the data, please contact Mr. Jim Humphreys of my staff on (301)744-6745.

Sincerely,

MICHAEL W. DUNN
Director, Air, Water, & Natural
Resources Management Division
By direction of the Commander

Encl:
(1) Sanitary Sludge Data
Report for 1998
(2) Laboratory Reports

Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway, Baltimore, Maryland 21224

Sewage Sludge Analysis Report

1. Name of Sludge Generator: INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER

2. Sample Date: 09/02/98 09/23/98 12/14/98

3. pH 6.1

4. Sample Type: ☒ Grab ☐ Composite

5. Solids Content 86.9 %

6. Sludge Type: ☐ Raw, Unstabilized ☒ Aerobically Digested
☒ Air Dried ☐ Composted ☐ Lime Stabilized ☐ Anaerobically Digested
☐ Other (Describe):

7. Laboratory Name: CHESAPEAKE ANALYTICAL LABORATORY, INC.
IHD, NSWC TEST AND EVALUATION DEPT.

8. Results of Analysis: * Optional **Lime Amended Sludges

Parameter Analyzed		Value	Units	Detection limit (MG/L)
Total Phosphorus	TP	10,100 (MG/KG)	mg/kg	0.05
Total Potassium	TK	710 (MG/KG)	mg/kg	0.1
Total Kjeldahl Nitrogen	TKN	11,800 (MG/KG)	%	0.5
Ammonium Nitrogen	NH_4	1,700 (MG/KG)	%	0.1
Nitrate Nitrogen	NO_3	10.7 (MG/KG)	mg/kg	0.05
Cadmium	Cd	0.0206	mg/kg	0.010
Copper	Cu	0.535	mg/kg	0.050
Nickel	Ni	0.133	mg/kg	0.100
Lead	Pb	<0.060	mg/kg	0.100
Zinc	Zn	3.09	mg/kg	0.005
Mercury	Hg	<0.00030	mg/kg	0.0005
*Arsenic	As	0.0514	mg/kg	0.005
*Molybdenum	Mo	———	mg/kg	———
*Selenium	Se	———	mg/kg	———
PCBs	PCB	<5 (MG/KG)	mg/kg	5.0 (MG/KG)
**Calcium Carbonate Equivalent	$CaCO_3$	———		———

Certification: As an authorized representative of the above named sewage sludge generator, I certify that the above information is correct and complete to the best of my knowledge.

Name: MICHAEL W. DUNN

Title: DIRECTOR, AIR, WATER & ~~NATURAL RESOURCES DIVISION~~

Signature: Michael W. Dunn

Date: 12/22/98

Phone: (301) 744-4320

Attach a copy of Laboratory Report

rev. 3/96

CHESAPEAKE ANALYTICAL LABORATORY, INC.

106A Rockefeller Court Waldorf, Maryland 20602
Phone: (301) 932-4775

NSWC-Indian Head Division
Indian Head, MD 20640
Attn: Alex Bryan

REPORT OF ANALYSIS
October 6, 1998

RECEIVED: 09/02/98, 1445 SOURCE: SS01 Sludge Analysis

COLLECTION INFORMATION:

SAMPLE ID	DATE & TIME	PERSERVATIVE	SAMPLE TYPE
SS01 Sludge	09/02/98 @ 0950	4 C	GRAB

ANALYTICAL INFORMATION:

Physical Parameter	Result
% Solids	*86.9*
pH	*6.1*

SAMPLE ID	TPH, mg/kg Wet Weight	TPH, mg/kg Dry Weight
SS01 Sludge	280	320

ANALYTICAL INFORMATION:

PARAMETER	METHOD	PREP DATE	ANALYSIS DATE	ANALYST
TPH	418.1	09/30/98	10/06/98	JM
%Solids	160.3		09/04/98	SH
pH	150.1		09/04/98, 1510	SH

Reviewed and Approved by: Debra Knott

Debra Knott
Laboratory Supervisor

****
** CHEMICAL AND PHYSICAL ANALYSIS REPORT SSIC 8010 **
****

RECEIVED: 09/02/98
SPEC NUMBER:
SAMPLE NUMBER: 200016994
SAMPLE DESCRIPTION: IHD, NSWC Sludge (TCLP Extract)
CONTRACT NUMBER:
QATIP:
MANUFACTURER:
OTHER SPEC:
LOT #:
CUSTOMER SAMPLE #: SS01/STP

REQUESTED ANALYSIS	UNIT	RESULTS	MIN.	MAX.
TCLP Elements				
Ag : Silver Content	Milligrams/L	< 0.030	-	5.0
As : Arsenic Content	Milligrams/L	0.0514	-	5.0
Ba : Barium Content	Milligrams/L	0.0354	-	100.
Cd : Cadmium Content	Milligrams/L	0.0206	-	1.0
Cr : Chromium Content	Milligrams/L	< 0.0085	-	5.0
Hg : Mercury Content	Milligrams/L	< 0.00030	-	0.20
Pb : Lead Content	Milligrams/L	< 0.060	-	5.0
Se : Selenium Content	Milligrams/L	< 0.0030	-	1.0
Miscellaneous Elements				
Co : Cobalt Content	Milligrams/L	0.139	-	-
Cu : Copper Content	Milligrams/L	0.535	-	-
Fe : Iron Content	Milligrams/L	0.211	-	-
Mg : Magnesium Content	Milligrams/L	33.1	-	-
Mn : Manganese Content	Milligrams/L	7.95	-	-
Ni : Nickel Content	Milligrams/L	0.133	-	-
Sb : Antimony Content	Milligrams/L	< 0.055	-	-
V : Vanadium Content	Milligrams/L	< 0.0052	-	-
Zn : Zinc Content	Milligrams/L	3.09	-	-

COMMENT: The sample was tested in accordance with the Toxicity Characteristic Leaching Procedure (Method 1311, SW-846) described in the Federal Register, Part II, EPA, 40 CFR Part 261 et al., "Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristic Revisions", June 29, 1990. Those results which are preceded by a less than symbol indicate that the analytes could not be detected at or above the detection limit of the analytical instrument. The number appearing to the right of the less than symbol is the detection limit of the analytical instrument for this particular analysis. An analysis was not requested on analytes reported as "NR". An asterisk "*" indicates analyte concentrations which exceed the regulatory level.

Rob DeMarr RSD, for

ANALYSTS: Robert DeMarr, Nievo Namata DATE: 09/25/98

LABORATORY MANAGER: _____
Bruce Thomas

CC: 045J (J. Humphreys)

10/07/98

CHESAPEAKE ANALYTICAL LABORATORY, INC.

106A Rockefeller Court Waldorf, Maryland 20602
Phone: (301) 932-4775

NSWC-Indian Head Division
Indian Head, MD 20640
Attn: Alex Bryan

REPORT OF ANALYSIS
October 6, 1998

RECEIVED: 09/23/98, 1410 SOURCE: SS01 Sludge Analysis

COLLECTION INFORMATION:

SAMPLE ID	DATE & TIME	PERSERVATIVE	SAMPLE TYPE
SS01 Sludge	09/23/98 @ 1150	4 C	GRAB

SAMPLE ID	PCB, mg/kg Wet Weight	PCB, mg/kg Dry Weight
SS01 Sludge	< 5	< 6

ANALYTICAL INFORMATION:

PARAMETER	METHOD	PREP DATE	ANALYSIS DATE	ANALYST
PCB	8082	09/24/98	09/30/98	PSS

Reviewed and Approved by: Debra Knott
Debra Knott
Laboratory Supervisor

12/30/98

CHESAPEAKE ANALYTICAL LABORATORY, INC.

106A Rockefeller Court Waldorf, Maryland 20602
Phone: (301) 932-4775

IHDIVNAVSURFWARCEN
101 Strauss Avenue
Indian Head, MD 20640
Attn: Jim Humphreys

REPORT OF ANALYSIS

December 22, 1998

SAMPLE INFORMATION:
RECEIVED:12/16/98@ 1220

SOURCE: IHDIVNAVSURFWARCEN WWTP Sludge

COLLECTION INFORMATION:

SAMPLE ID	DATE	TIME	PRESERVATIVE	SAMPLE TYPE
SS01/Sludge 8188	12/14/98	0930	4 c	GRAB

ANALYTICAL INFORMATION:

Chemical Parameters

Sample ID	*EPA Method*	*mg/kg Wet Weight*	*Prep Date*	*Analysis Date*	*Analyst*
TKN	351.2	11800	12/18/98	12/18/98	JM
NH3-N	350.1	1170	12/22/98	12/22/98	JM
NO2/NO3-N	353.2	10.7	12/21/98	12/21/98	JM
Total Phosphorus	365.1	10100	12/21/98	12/22/98	JM
Total Potassium (K)	258.1	710	12/21/98	12/22/98	DK

NOTE: All results reported as mg/Kg, wet-weight basis. Samples digested for potassium using EPA method 3050. All analyses performed by EPA approved procedures.

Reviewed and Approved by: Debra Knott

Debra Knott
Laboratory Supervisor

DEPARTMENT OF THE NAVY
INDIAN HEAD DIVISION
NAVAL SURFACE WARFARE CENTER
101 STRAUSS AVE
INDIAN HEAD MD 20640-5035

5090
Ser 045J/192
23 Nov 99

Ms. Kelly Robison
Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

Dear Ms. Robison,

We are submitting to you our annual sewage sludge analysis data for calendar year 1999. The Sewage Sludge Utilization Permit number for this activity is S-99-30-3483-T.

If you have any questions regarding the data, please contact Mr. Jim Humphreys of my staff on (301)744-6745.

Sincerely,

MICHAEL W. DUNN
Director, Air, Water, & Natural
Resources Management Division
By direction of the Commander

Encl:
(1) Sanitary Sludge Data
Report for 1999
(2) Laboratory Reports

Maryland Department of the Environment
Waste Management Administration
2500 Broening Highway, Baltimore, Maryland 21224

Sewage Sludge Analysis Report

1. Name of Sludge Generator: Indian Head Division
Naval Surface Warfare Center

2. Sample Date: 09/07/99 & 10/29/99 | **3. pH** . 6.7

4. Sample Type: ☒ Grab ☐ Composite | **5. Solids Content** 90.9 %

6. Sludge Type: ☐ Raw, Unstabilized ☒ Aerobically Digested
☒ Air Dried ☐ Composted ☐ Lime Stabilized ☐ Anaerobically Digested
☐ Other (Describe):

7. Laboratory Name: Chesapeake Analytical Laboratory, Inc.
IHD, NSWC Test And Evaluation Dept.

8. Results of Analysis: * Optional **Lime Amended Sludges

Parameter Analyzed		Value	Units	Detection limit (mg/L)
Total Phosphorus	TP	11400	mg/kg	0.05
Total Potassium	TK	1300	mg/kg	0.1
Total Kjeldahl Nitrogen	TKN	26400	(mg/kg) %	0.5
Ammonium Nitrogen	NH_4	2540	(mg/kg) %	0.1
Nitrate Nitrogen	$N0_3$	3.11	mg/kg	0.05
Cadmium	Cd	0.0157 (mg/L)	mg/kg	1.0 (MAX)
Copper	Cu	0.414 (mg/L)	mg/kg	0.050
Nickel	Ni	0.132 (mg/L)	mg/kg	0.100
Lead	Pb	< 0.11 (mg/L)	mg/kg	5.0 (MAX)
Zinc	Zn	2.94 (mg/L)	mg/kg	0.005
Mercury	Hg	< 0.18 (mg/L)	mg/kg	0.20 (MAX)
*Arsenic	As	< 0.45 (mg/L)	mg/kg	5.0 (MAX)
*Molybdenum	Mo	----------	mg/kg	----------
*Selenium	Se	< 0.14 (mg/L)	mg/kg	1.0 (MAX)
PCBs	PCB	< 0.5	mg/kg	5.0 (mg/kg)
**Calcium Carbonate Equivalent	$CaC0_3$	----------		----------

Certification: As an authorized representative of the above named sewage sludge generator, I certify that the above information is correct and complete to the best of my knowledge.

Name: Michael W. Dunn | **Title:** Director, Air, Water, & Natural Resources MGMT Division

Signature: | **Date:** 11/23/99

Phone: (301) 744-4320

Attach a copy of Laboratory Report

rev. 3/96

9/29/99

CHESAPEAKE ANALYTICAL LABORATORY, INC.

106A Rockefeller Court · Waldorf, Maryland 20602
Phone: (301) 932-4775

NSWC-Indian Head Division
101 Strauss Avenue
Bldg. No. D-327
Indian Head, MD 20640-5000
Attn: Jim Humphreys

REPORT OF ANALYSIS

September 23, 1999

RECEIVED: 09/08/99 @ 1410

SOURCE: Wastewater Treatment Plant Samples
COLLECTOR: Jim Humphreys

SAMPLE INFORMATION:

SAMPLE ID	DATE/TIME	PERSERVATIVE	SAMPLE TYPE
SS01 Sludge/9122	09/07/99 @ 0900	4 C	GRAB

ANALYTICAL RESULTS:

SAMPLE ID	%SOLIDS	pH	PCB mg/Kg	TPH mg/Kg
SS01 Sludge	90.9	6.7	< 0.5	295

ANALYTICAL INFORMATION:

PARAMETER	METHOD	PREP DATE	ANALYSIS DATE	ANALYST
% Solids	160.3		09/14/99	CM
pH	150.1		09/14/99 @ 0910	CM
PCB	8082	09/20/99	09/21/99	PSS
TPH	418.1	09/16/99	09/21/99	SH

Re[illegible]ved and Approved by: Debra Knott

Debra Knott
Laboratory Supervisor

****

CHEMICAL AND PHYSICAL ANALYSIS REPORT: SSIC 8010

****

LAB NUMBER: 200022219
SAMPLE DESCIPTION: SS01 Sludge / 9122 (TCLP Extract)
CUSTOMER SAMPLE NUMBER: 9122
ANALYSIS DATE: 10/01/99

DATE RECEIVED: 09/07/99
DATE SAMPLED: 09/07/99
SUBMITTER: J. Humphreys
SAMPLER: J. Humphreys

REQUESTED ANALYSIS		UNITS	RESULTS	LIMITS MIN	LIMITS MAX
	TCLP Elements				
Ag:	Silver Content	milligrams/L	< 0.050	-	5.0
As:	Arsenic Content	milligrams/L	< 0.45	-	5.0
Ba:	Barium Content	milligrams/L	0.105	-	100.
Cd:	Cadmium Content	milligrams/L	0.0157	-	1.0
Cr:	Chromium Content	milligrams/L	< 0.014	-	5.0
Hg:	Mercury Content	milligrams/L	< 0.18	-	0.20
Pb:	Lead Content	milligrams/L	< 0.11	-	5.0
Se:	Selenium Content	milligrams/L	< 0.14	-	1.0
	Miscellaneous Elements				
Al:	Aluminum Content	milligrams/L	< 0.050	-	-
B :	Boron Content	milligrams/L	0.210	-	-
Ca:	Calcium Content	milligrams/L	128.	-	-
Cu:	Copper Content	milligrams/L	0.414	-	-
Fe:	Iron Content	milligrams/L	< 0.010	-	-
Mg:	Magnesium Content	milligrams/L	35.9	-	-
Mn:	Manganese Content	milligrams/L	5.09	-	-
Ni :	Nickel Content	milligrams/L	0.132	-	-
Sb :	Antimony Content	milligrams/L	< 0.057	-	-
Zn:	Zinc Content	milligrams/L	2.94	-	-

COMMENT: The sample was tested in accordance with the Toxicity Characteristic Leaching Procedure (Method 1311, SW-846) described in the Federal Register, Part II, EPA, 40 CFR Part 261 et al., "Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristic Revisions", June 29, 1990. Those results which are preceded by a less than symbol indicate that the analytes could not be detected at or above the detection limit of the analytical instrument. The number appearing to the right of the less than symbol is the detection limit of the analytical instrument for this particular analysis. An analysis was not requested on analytes reported as "NR". An asterisk "*" indicates analyte concentrations which exceed the regulatory level.

ANALYST(S): Robert DeMarr — DATE: 10-6-99

LABORATORY MANAGER: Bruce Thomas — DATE: 10/6/99

CC: 045J (J. Humphreys)

NSWC-Indian Head Division
101 Strauss Avenue
Bldg. No. D-327
Indian Head, MD 20640
Attn: Jim Humphreys

REPORT OF ANALYSIS

November 19, 1999

RECEIVED. 10/29/99 @1305

SOURCE: IHDIVNAVSURWARCEN
COLLECTOR: Jim Humphreys

SAMPLE INFORMATION:

SAMPLE ID	DATE/TIME	PRESERVATIVE	SAMPLE TYPE
SS01 Sludge 1957	10/29/99 @ 1115	4 c	GRAB

ANALYTICAL INFORMATION:

Physical Parameters

Sample ID	EPA Method	Result	Analysis Date	Analyst
% Solids	160.3	88.2	11/05/99	SH

Chemical Parameters

Sample ID	EPA Method	mg/kg Wet Weight	mg/kg Dry Weight	Prep Date	Analysis Date	Analyst
TKN	351.2	26400	29900	11/17/99	11/18/99	DB
NH3-N	350.1	2540	2880	11/18/99	11/18/99	DB
NO2/NO3-N	353.2	3.11	3.53	11/17/99	11/17/99	DB
Total P	365.1	11400	12900	11/06/99	11/06/99	DB
Potassium (K)	258.1	1300	1470	11/05/99	11/19/99	DK/SH

NOTE: All results reported as mg/Kg. wet-weight basis. Samples digested for metals using EPA method 3050. All analyses performed by EPA approved procedures.

Reviewed and Approved by: Debra Knott

Debra Knott
Laboratory Supervisor

Appendix C
Memorandum Regarding Mercury Analysis of Soil in the P-Chem Division Area, June 25, 1993

8000
Ser 3330H/196/ckr
25 June 1993

MEMORANDUM

From: 3330H
To: 330
Via: 3330

Subj: MERCURY ANALYSIS OF SOIL IN THE P-CHEM DIVISION AREA

Encl: (1) Table-Analytical Results

1. During recent development work for improvement of our cold vapor atomic absorption (CVAA) system for mercury analysis, several "real world" soil samples were taken for analysis from the ground outside buildings in Physical Chemistry Division area. Results of the analyses are listed in the enclosure (1).

2. The analyses were performed in full compliance with Method 7471 of Test Methods for Evaluating Solid Waste, Third Edition, SW-846, USEPA, Office of Solid Waste, Revision 2, November 1990. All applicable QA/QC procedures were followed.

3. Mercury in surface soil outside buildings 102, 444, and 108 is present in sufficient quantities to classify the material as TCLP toxic in accordance with 40 Code of Federal Regulations, Part 261, if an appropriate sample of the material fails the TCLP test. The number listed under "Possible TCLP Concentration (mg/l)" in enclosure (1) is calculated assuming all of the mercury present in the sample is extracted into the appropriate TCLP test solution during the TCLP test procedure.

In accordance with Section 1.0 of Appendix II-Method 1311 Toxicity Characteristic Leaching Procedure (TCLP), Federal Register, Volume 55, Number 61, March 29, 1990, page 11863, the TCLP procedure must be used to determine if a sample is TCLP toxic if a total analysis indicates a regulated contaminant is present in quantities which could exceed the regulatory limit. The regulatory TCLP limit for mercury is 0.2 milligrams per liter of TCLP extract; therefore, samples near buildings 102, 444, 108, and possibly 1797 would need TCLP testing as opposed to total mercury analysis.

Further testing will also be needed to determine the extent of mercury contamination, both surface area and depth, in the Physical Chemistry Division area of operation.

04/20/00 THU 14:22 [TX/RX NO 7126]

8000
Ser 3330H/196/
25 June 1993

Subj: MERCURY ANALYSIS

4. Analytical data and exact location of the sample sites can be provided if needed. If there are any further questions, please call on extension 4759 or 1219.

Steve Helberg
STEVE HELBERG

04/20/00 THU 14:22 [TX/RX NO 7126]

ANALYTICAL RESULTS FOR

MERCURY ANALYSIS OF SOIL SAMPLES

IN THE

PHYSICAL CHEMISTRY DIVISION AREA OF OPERATION

Location	Sample Number	MG/KG (wet)	Possible TCLP Concentration (mg/l)
B-102	1	25.2	1.26
B-109A	2	0.216	0.0108
B-444	3	128.	6.40
B-1797	4	2.31	0.116
B-108	5	4.05	0.202
B-556 (parking) (lot)	6	<0.16	N/A

04/20/00 THU 14:22 [TX/RX NO 7126]

Leszkiewicz, Craig/WDC

From: Estabrook, Anne/WDC
Sent: April 25, 2000 3:46 PM
To: Leszkiewicz, Craig/WDC
Subject: FW: MERCURY SAMPLING AT LAB AREA

Craig,
Here's some info from Shawn on the mercury samples mentioned in the memo I gave you. I'll talk to you tomorrow about a sampling approach for these areas after I talk to the team.
Anne

-----Original Message-----
From: Jorgensen Shawn A IHMD [mailto:JorgensenSA@ih.navy.mil]
Sent: April 25, 2000 3:18 PM
To: Estabrook, Anne
Cc: Mcarthur Heidi A IHMD
Subject: MERCURY SAMPLING AT LAB AREA

Anne,

I have spoken to two people already concerning the sampling that was performed in the memo that I sent to you about the lab area (8000, Ser 3330H/196/ckr of 25 Jun 93). I'm not sure what is wrong with these people, but apparently seven years is a long time!?!

The Building 102 sample was taken on the ground outside the back of the building (SSE from the building on your map). Mercury nitrometers were used in the basement and some sort of tank was inside that the mercury/water flowed to or was poured into. Water from this tank was poured on the ground outside the building, right outside the back door.

The Building 444 sample, as far as Steve Helberg can remember, was taken in "a natural drainage ditch the came from Building 102 outside of Building 444." I don't particular remember a "natural drainage ditch" right outside of Building 444, but it is worth investigating. I plan to run down there in the near future to check it out.

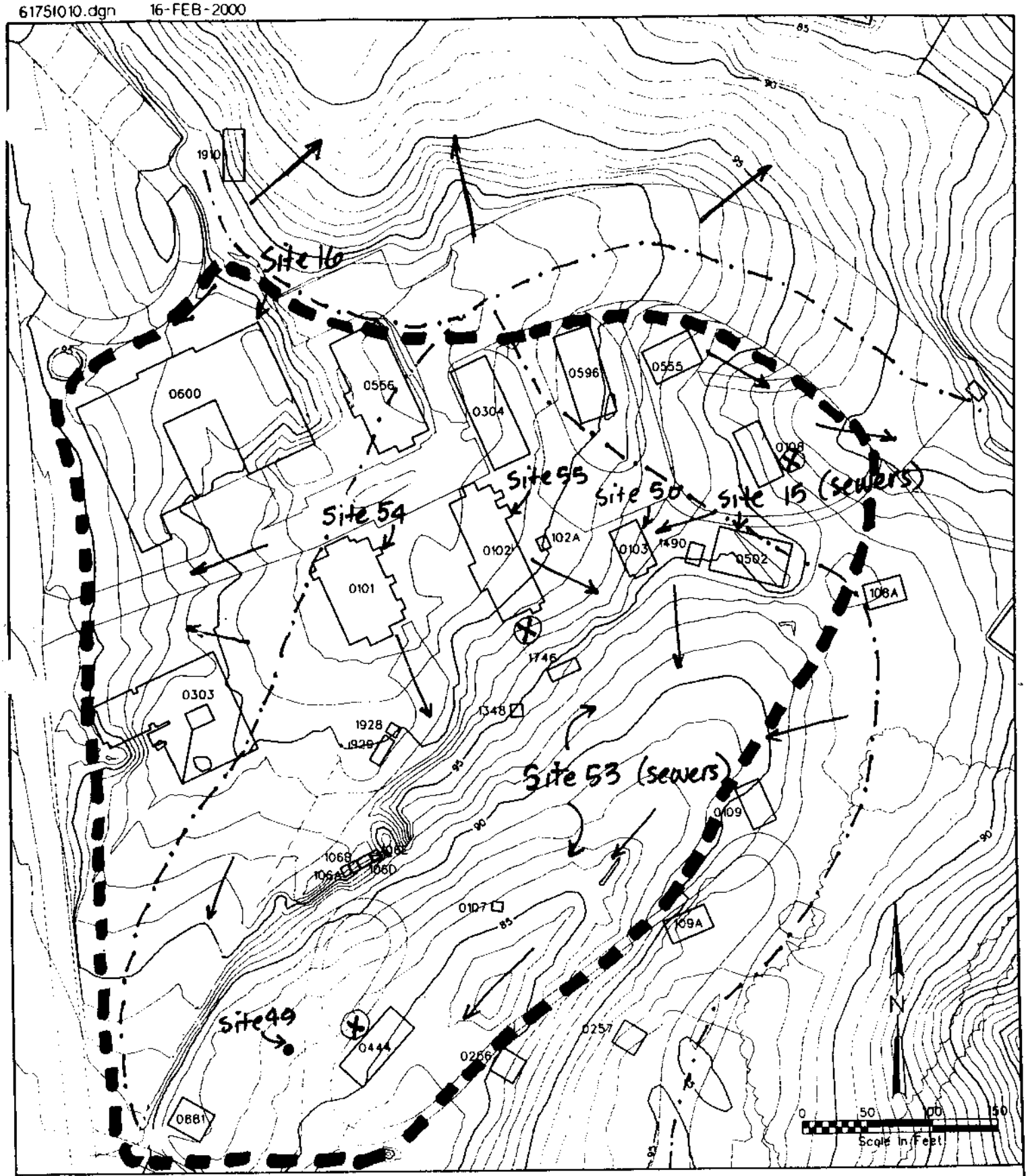
Steve was not certain about the sample taken around Building 108, as a matter of fact, he was not certain where the building was. I assume that it, too, was near a building exit, where water, possibly containing mercury, was poured. I will look around that building, also, to see what I can see.

I will try to get pictures and email them to you. Also, I will provide my best guess on locations (on your map) after I see the sites.

If you have any questions, please give me a call.

Thanks,
Shawn Jorgensen
Indian Head Division
Naval Surface Warfare Center
ATTN: Code 046C, Bldg. D-327
101 Strauss Avenue
Indian Head, MD 20640-5035
Phone - (301) 744-6745
Fax - (301) 744-4180
Email - jorgensensa@ih.navy.mil

61751010.dgn 16-FEB-2000



⊗ = mercury detected in surface soil (6/93)

→ = approximate surface water flow direction

—·— = approximate drainage divide

▬ ▬ ▬ = proposed limits of "lab area"

Figure
SITES 15 AND 53 EXISTING CONDITIONS
RI WORK PLAN
NAVAL SURFACE WARFARE CENTER
INDIAN HEAD DIVISION

CH2MHILL

Appendix D
Summary of Use Report
Buildings 303, 304, 555, and 596

SUMMARY OF USE REPORT
BUILDINGS 303, 304, 555 & 596

NAVAL SURFACE WARFARE CENTER, INDIAN HEAD, MARYLAND

Prepared by:
James E. Dolph
Industrial Historian
Portsmouth Naval Shipyard
Portsmouth, NH

May 27, 2000

BUILDING 303 – SUMMARY OF USE	
Date	**Description**
1918	Building Constructed
1918 – 49	Chemical Laboratory Office Building
1957 – 59	Production & Safety Office Building
1961 – 67	Production Building
1999	Office Building

BUILDING 303 – HISTORIC NOTES	
Date	**Description**
1940	An architectural plan shows two photographic darkrooms and a general workroom in the basement of the building.
1944	An architectural plan shows that all spaces on the first floor are offices.
1956	An architectural plan shows a paper cutting room, paper dipping machine and chemical storage room in the basement.
1978	An architectural plan shows that all spaces in the basement and on the first floor are offices.

BUILDING 304 – SUMMARY OF USE	
Date	**Description**
1918	Building Constructed (additions 1940 & 41)
1918 – 49	Chemical Laboratory Storehouse
1957 – 61	Storehouse
1961	Storehouse & Retail Outlet #4
1999	Storehouse/Wastewater Laboratory

BUILDING 304 – HISTORIC NOTES	
Date	**Description**
1990	A Supply Department architectural plan shows numerous storage shelves in the building.

A 1980 Hazardous Materials survey listed the following chemicals and compounds as being stored in Building 304:

Name	Annual Quantity Stored	Storage Container
Acetic anhydride	72 lbs.	Glass bottles
Acetone	unknown	Glass bottles
Ammonium acetate	9 lbs.	Unknown
Ammonium bichromate	5 lbs.	Unknown
Ammonium carbonate	5 lbs.	Unknown
Ammonium chloride	18 lbs.	Unknown
Ammonium oxalate	10 lbs.	Unknown
Ammonium perchlorate	19 lbs.	Unknown
Ammonium sulfide	20 lbs.	Metal can
Ammonium sulfite (30% solution)	2.25 lbs.	Unknown
Ammonium thiocyanate	9 lbs.	Unknown
Amyl acetate	2.7 lbs.	Unknown
Antimony trioxide	2.5 lbs.	Unknown

1980 Hazardous Materials survey cont:

Name	Annual Quantity Stored	Storage Container
Cadmium (metal)	2 lbs.	Unknown
Cadmium chloride	2.25 lbs.	Unknown
Calcium carbide	2 lbs.	Unknown
Calcium hydroxide	6 lbs.	Unknown
Calcium hypochlorite	24 lbs.	Unknown
Carbon disulfide	4.5 gals.	Unknown
Carbon tetrachloride	11.5 gals.	Unknown
Chloroform	31 gals.	Unknown
Cupric chloride	9 lbs.	Unknown
Cupric sulfate	18 lbs.	Unknown
Dibutyl phthalate	78 lbs.	Unknown
Dimethylamine hydrochloride	4.4 lbs.	Unknown
Ferric chloride	22 lbs.	Unknown
Ferric nitrate	6 lbs.	Unknown
Ferric sulfate	15 lbs.	Unknown
Ferrous ammonium sulfate	5 lbs.	Unknown
Formaldehyde	17 lbs.	Unknown
Formic acid	20 lbs.	Unknown
Hydrofluoric acid (40%)	33 lbs.	Unknown
Hydrogen peroxide (30%)	2.75 gals.	Unknown
Lead acetate	5 lbs.	Unknown
Lead chromate (chrome yellow)	9 lbs.	Unknown
Lead nitrate	3 lbs.	Unknown
Lead sulfate	3.75 lbs.	Unknown
Mercuric sulfate	3.25 lbs.	Unknown
Phenol	9 lbs.	Unknown
Phosphorus pentachloride	1 lb.	Unknown
Phosphorus pentoxide	6 lbs.	Unknown
Potassium bichromate	19 lbs.	Unknown
Potassium chromate	5 lbs.	Unknown
Potassium cyanide	7 lbs.	Unknown
Potassium permanganate	10 lbs.	Unknown
Pyridine	12.9 gals.	Unknown
Selenium (powder)	1 lb.	Unknown
Silver nitrate	11 lbs.	Unknown
Sodium azide	8 lbs.	Unknown
Sodium chromate	2 lbs.	Unknown

1980 Hazardous Materials survey cont:

Name	Annual Quantity Stored	Storage Container
Sodium cyanide	3 lbs.	Unknown
Sodium dichromate	263 lbs.	Glass bottles or drums
Sodium fluoride	Unknown	Unknown
Sodium hydroxide	45 lbs.	Bottles
Sodium nitrite	Unknown	Unknown
Sodium phosphate, dibasic	2 lbs.	Unknown
Sulfuric acid	243 lbs.	Unknown
Toulene	Unknown	Unknown
Zinc (metal)	36 lbs.	Unknown
Zinc acetate	11 lbs.	Unknown
Zinc chloride	19.8 lbs.	Unknown
Zinc nitrate	9 lbs.	Unknown
Zinc sulfate	3 lbs.	Unknown

The 1986 NAVORDSTA OIL/HAZARDOUS SUBSTANCE CONTINGENCY PLAN lists the following chemicals and compounds as being in Building 304:

Name	Annual Quantity Stored	Storage Container
Cupric sulfate ($CuSO_4$)	18 lbs.	Bottles
Dibutylphthalate	50 lbs.	Glass bottles
Pyridine	40 lbs.	Glass bottles
Silver Nitrate ($AgNO_3$)	5 lbs.	Glass bottles
Sodium nitrite ($NaNO_2$)	6,531 lbs.	Steel drums

BUILDING 555 SUMMARY OF USE	
Date	**Description**
1944	Building Constructed
1944 – 49	Surveillance Magazine
1957 – 61	Magazine 2Y2
1967 – 76	Explosive Test Laboratory
1999	(Magazine) Explosive Test Laboratory

BUILDING 555 – HISTORIC NOTES	
Date	**Description**
1968	An architectural plan was drawn for a proposal to renovations associated with Mixing and Measuring.
1974	An architectural plan indicates that a Rolling Mill was in the building.

The 1980 Hazardous Materials survey listed the following chemicals and compounds as being stored in Building 555:

Name	Annual Quantity Stored	Storage Container
Acrylonitrile	Unknown	1-gal. glass bottles
Dinitrochlorobenzene	Unknown	Metal drums on concrete floor
2, 4-Dinitrophenoxy ethanol (DNPHE)	685 lbs.	Plastic bags on concrete floor
Ferrous sulfate	Unknown	Unknown
Hydrochloric acid (Muriatic acid)	Unknown	Metal cabinets
Nitric acid (concd)	Unknown	Unknown
Phosphorus trichloride	5 lbs.	Unknown
Sodium hydroxide	400 lbs.	5-gal. cans
Sulfuric acid	Unknown	Unknown

The 1986 NAVORDSTA Oil/Hazardous Substance Contingency Plan lists the following chemicals and compounds as being in Building 555:

Name	Annual Quantity Stored	Storage Container
Acrylonitrile (CH_2CHCN)	Unknown	1-gal. glass bottles

BUILDING 596 - SUMMARY OF USE	
Date	**Description**
1945	Building Constructed
1949	Survellience Magazine #4
1957 – 61	Magazine 2Y1
1976	Stability Test Building
1999	Magazine (Stability Test Building)

References:

US Navy, *Public Works of the Navy Data Book,* Bureau of Yards and Docks, GPO, Washington, DC., July 1927

US Navy , *Public Works of the Navy Data Book,* Bureau of Yards and Docks, GPO, Washington, DC., July 1939

US Navy , *Public Works of the Navy Data Book,* Bureau of Yards and Docks, GPO, Washington, DC., July 1945

US Navy, *(NAVCOMP FORM 277) Class II Property Record Card – Building 303*, September 1956

US Navy, *(NAVCOMP FORM 277) Class II Property Record Card – Building 596*, August 1956

US Navy, *(NAVCOMP FORM 277) Class II Property Record Card – Building 304*, July 1954

US Navy, *(NAVCOMP FORM 277) Class II Property Record Card – Building 555*, August 1956

Indian Head General Development Maps, (various years)

Building 303 Architectural Plans (all years)

Building 304 Architectural Plans (all years)

Building 555 Architectural Plans (all years)

Building 596 Architectural Plans (all years)

US Navy, *Hazardous Materials Survey*, Indian Head, Md., 1980

US Navy, *Oil/Hazardous Substance Contingency Plan,* Naval Ordnance Station, Indian Head, Md., 1986

US Navy, *Building and Structure Inventory*, Naval Surface Warfare Center, Indian Head, Maryland, July 1998

Appendix E
Raw, Validated Analytical Data and Chain of Custody Forms

Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SS01		IS49SS02		IS53SS01		IS53SS02		IS53SS03		IS53SS04		IS53SS05		IS53SS06		IS53SS07		IS53SS08		IS53SS09		IS53SS10		
Sample ID	IS49SS010001		IS49SS020001		IS53SS010001		IS53SS020001		IS53SS030001		IS53SS040001		IS53SS050001		IS53SS060001		IS53SS070001		IS53SS080001		IS53SS090001		IS53SS100001		IS53SS10P0001	
Sample Date	05/02/01		05/02/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																									
Volatile Organic Compounds (µg/kg)																									
1,1,1-Trichloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,1,2,2-Tetrachloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11	B	44	B	55	B	NA		NA		NA		15	B	NA		NA		NA		NA		17	B	17	B
1,1,2-Trichloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,1-Dichloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,1-Dichloroethene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2,4-Trichlorobenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2-Dibromo-3-chloropropane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2-Dibromoethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2-Dichlorobenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2-Dichloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,2-Dichloropropane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,3-Dichlorobenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
1,4-Dichlorobenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
2-Butanone	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
2-Hexanone	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
4-Methyl-2-pentanone	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Acetone	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Benzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Bromodichloromethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Bromoform	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Bromomethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Carbon disulfide	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Carbon tetrachloride	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Chlorobenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Chloroethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Chloroform	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Chloromethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Cumene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Cyclohexane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Dibromochloromethane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Dichlorodifluoromethane(Freon-12)	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Ethylbenzene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Methyl acetate	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Methyl-tert-butyl ether (MTBE)	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Methylcyclohexane	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Methylene chloride	11	U	6.5	B	8.2	B	NA		NA		NA		4.4	B	NA		NA		NA		NA		4.9	B	4.5	B
Styrene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Tetrachloroethene	11	U	4.5	J	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Toluene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Trichloroethene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Trichlorofluoromethane(Freon-11)	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U

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Naval District Washington, Indian Head
Indian Head, Maryland

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Sample ID	IS49SS010001		IS49SS020001		IS53SS010001		IS53SS020001		IS53SS030001		IS53SS040001		IS53SS050001		IS53SS060001		IS53SS070001		IS53SS080001		IS53SS090001		IS53SS100001		IS53SS10P0001	
Sample Date	05/02/01		05/02/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																									
Vinyl chloride	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Xylene, total	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
cis-1,2-Dichloroethene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
cis-1,3-Dichloropropene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
o-Xylene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
trans-1,2-Dichloroethene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
trans-1,3-Dichloropropene	11	U	10	U	12	U	NA		NA		NA		10	U	NA		NA		NA		NA		11	U	12	U
Semi-volatile Organic Compounds (µg/kg)																									
1,1-Biphenyl	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2,2'-Oxybis(1-chloropropane)	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2,4,5-Trichlorophenol	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
2,4,6-Trichlorophenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2,4-Dichlorophenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2,4-Dimethylphenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2,4-Dinitrophenol	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
2-Chloronaphthalene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2-Chlorophenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2-Methylnaphthalene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2-Methylphenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
2-Nitroaniline	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
2-Nitrophenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
3,3'-Dichlorobenzidine	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
3- and 4-Methylphenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
3-Nitroaniline	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
4,6-Dinitro-2-methylphenol	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
4-Bromophenyl-phenylether	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
4-Chloro-3-methylphenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
4-Chloroaniline	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
4-Chlorophenyl-phenylether	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
4-Nitroaniline	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
4-Nitrophenol	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
Acenaphthene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Acenaphthylene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Acetophenone	360	U	340	U	210	J	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Anthracene	360	U	340	U	51	J	NA		NA		NA		350	U	NA		NA		NA		NA		43	J	55	J
Atrazine	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Benzaldehyde	360	U	340	U	230	J	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Benzo(a)anthracene	63	J	110	J	160	J	NA		NA		NA		54	J	NA		NA		NA		NA		220	J	260	J
Benzo(a)pyrene	70	J	110	J	150	J	NA		NA		NA		46	J	NA		NA		NA		NA		190	J	230	J
Benzo(b)fluoranthene	95	J	150	J	230	J	NA		NA		NA		63	J	NA		NA		NA		NA		230	J	320	J
Benzo(g,h,i)perylene	45	J	63	J	46	J	NA		NA		NA		350	U	NA		NA		NA		NA		75	J	84	J
Benzo(k)fluoranthene	360	U	48	J	99	J	NA		NA		NA		350	U	NA		NA		NA		NA		120	J	150	J
Butylbenzylphthalate	360	U	340	U	23,000		NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U

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Sample ID	IS49SS010001		IS49SS020001		IS53SS010001		IS53SS020001		IS53SS030001		IS53SS040001		IS53SS050001		IS53SS060001		IS53SS070001		IS53SS080001		IS53SS090001		IS53SS100001		IS53SS10P0001	
Sample Date	05/02/01		05/02/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																										
Caprolactam	360	R	340	R	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Carbazole	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	55	J
Chrysene	76	J	130	J	190	J	NA		NA		NA		55	J	NA		NA		NA		NA		230	J	290	J
Di-n-butylphthalate	45	J	52	J	890		NA		NA		NA		130	J	NA		NA		NA		NA		320	J	240	J
Di-n-octylphthalate	360	U	340	U	170	J	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Dibenz(a,h)anthracene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Dibenzofuran	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Diethylphthalate	360	U	340	U	46	J	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Dimethyl phthalate	360	U	340	U	40	J	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Fluoranthene	120	J	230	J	330	J	NA		NA		NA		110	J	NA		NA		NA		NA		450		600	
Fluorene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Hexachlorobenzene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Hexachlorobutadiene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Hexachlorocyclopentadiene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Hexachloroethane	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Indeno(1,2,3-cd)pyrene	43	J	58	J	43	J	NA		NA		NA		350	U	NA		NA		NA		NA		82	J	81	J
Isophorone	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Naphthalene	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Pentachlorophenol	910	U	850	U	990	U	NA		NA		NA		880	U	NA		NA		NA		NA		940	U	970	U
Phenanthrene	59	J	140	J	240	J	NA		NA		NA		57	J	NA		NA		NA		NA		230	J	310	J
Phenol	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Pyrene	110	J	220	J	320	J	NA		NA		NA		100	J	NA		NA		NA		NA		380		500	
bis(2-Chloroethoxy)methane	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
bis(2-Chloroethyl)ether	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
bis(2-Ethylhexyl)phthalate	360	U	340	U	1,900		NA		NA		NA		37	J	NA		NA		NA		NA		57	J	56	J
n-Nitroso-di-n-propylamine	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
n-Nitrosodiphenylamine	360	U	340	U	400	U	NA		NA		NA		350	U	NA		NA		NA		NA		370	U	390	U
Explosives (µg/kg)																										
1,3,5-Trinitrobenzene	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
1,3-Dinitrobenzene	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
2,4,6-Trinitrotoluene	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
2,4-Dinitrotoluene	540	U	510	U	7,300	J	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	760	J	580	UJ
2,6-Dinitrotoluene	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
2-Amino-4,6-dinitrotoluene	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	2,135	J	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
2-Nitrotoluene	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
3-Nitrotoluene	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
4-Amino-2,6-dinitrotoluene	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
4-Nitrotoluene	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
HMX	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
Nitrobenzene	540	U	510	U	580	UJ	570	UJ	560	UJ	600	UJ	520	UJ	590	UJ	640	UJ	590	UJ	620	UJ	550	UJ	580	UJ
Nitrocellulose	2,700	U	2,600		4,800		1,500	U	2,800	U	5,500		2,600	U	4,600		14,000		3,000	U	3,100	U	2,800	U	2,900	U
Nitroglycerin	54,000	U	51,000	U	58,000	U	57,000	U	56,000	U	60,000	U	52,000	U	59,000	U	64,000	U	59,000	U	62,000	U	55,000	U	58,000	U
Nitroguanidine	110,000	U	100,000	U	120,000	U	110,000	U	110,000	U	120,000	U	100,000	U	120,000	U	130,000	U	120,000	U	120,000	U	110,000	U	120,000	U

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Sample ID	IS49SS010001		IS49SS020001		IS53SS010001		IS53SS020001		IS53SS030001		IS53SS040001		IS53SS050001		IS53SS060001		IS53SS070001		IS53SS080001		IS53SS090001		IS53SS100001		IS53SS10P0001	
Sample Date	05/02/01		05/02/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																									
PETN	54,000	U	51,000	U	58,000	U	57,000	U	56,000	U	60,000	U	52,000	U	59,000	U	64,000	U	59,000	U	62,000	U	55,000	U	58,000	U
RDX	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
Tetryl	540	U	510	U	580	U	570	U	560	U	600	U	520	U	590	U	640	U	590	U	620	U	550	U	580	U
Total Metals (mg/kg)																									
Aluminum	4,430		4,380		4,310		5,290		4,680		2,990		4,490		4,150		3,190		3,160		4,900		1,600		2,110	
Antimony	0.67	UL	0.62	UL	2.9	J	0.69	U	2.7	J	0.74	U	0.65	U	1.2	J	4	J	0.71	U	0.77	U	0.69	U	0.72	U
Arsenic	13.4		6.7		12.6		13.1		20.1		17.1		3.5		12.2		7.7		2.3	J	7.2		6.9		8.3	
Barium	34	J	23.6	J	213		55.5		221		163		32.6	J	42.2	J	43.8	J	34	J	45.3	J	38.3	J	47.4	
Beryllium	0.47	J	0.19	J	0.24	J	0.34	J	0.48	J	0.24	J	0.31	J	0.39	J	0.33	J	0.16	J	0.32	J	0.28	J	0.32	J
Cadmium	0.2	J	0.25	J	5.3		1.1	J	11.7		5.1		0.08	U	4.1		0.54	J	0.09	U	0.14	J	0.41	J	0.52	J
Calcium	1,590		99,000		2,020		947	J	3,010		387	J	994	J	2,210		1,540		396	J	1,090	J	1,520		2,130	
Chromium	16.6		12.6		20.6		16.8		23.9		11.2		12.6		17.2		11.9		10.7		10.4		4.3		10.7	
Cobalt	9.5	J	4.1	J	9.7	J	5.7	J	5.4	J	3.5	J	5.2	J	6.1	J	2.8	J	1.8	J	8.4	J	3.7	J	5.1	J
Copper	18.2		10.9		182		17.6		65.7		18.3		7.3		27.5		54.3		34.4		33		16.5		18.7	
Cyanide	0.55	U	0.51	U	0.6	U	0.57	U	0.57	U	0.61	U	0.52	U	0.6	U	0.64	U	0.59	U	0.63	U	0.56	U	0.58	U
Iron	11,800		8,300		17,200		17,700		16,300		4,480		9,530		15,100		7,550		6,900		7,750		2,380		5,050	
Lead	20.8		21.5		2,330		1,230		5,860		6,630		24.2		332		273		63.9		52.1		414		952	
Magnesium	5,810		7,320		1,710		666	J	1,050	J	319	J	859	J	424	J	331	J	607	J	281	J	692	J	1,270	
Manganese	130		123		205		210		104		119		176		410		169		35.1		102		93.8		150	
Mercury	0.3		0.2		111		111		637		18.2		0.3		13.5		0.11	U	1.7		2.7		44.7		43.1	
Nickel	76.7		21.9		28.4		7.3	J	8.2	J	2.9	J	12.2		14.2		7.3	J	18.2		8.4	J	19.3		25.7	
Potassium	665	J	700	J	303	J	358	J	505	J	180	J	336	J	157	J	143	J	185	J	149	J	172	J	233	J
Selenium	0.69	UL	0.64	UL	0.75	U	0.71	U	0.72	U	0.85	J	0.67	U	0.86	J	0.79	U	0.74	U	0.8	U	0.71	U	0.75	U
Silver	0.34	J	0.26	U	0.97	J	0.52	J	0.81	J	0.31	U	0.27	U	1.7	J	0.98	J	0.74	J	3.1		0.29	U	0.3	U
Sodium	57.7	U	53.8	U	272	J	148	J	358	J	234	J	56.1	U	227	J	66.3	U	61.4	U	70.6	J	59.4	U	62.3	U
Thallium	0.84	U	0.78	U	0.92	U	0.87	U	0.88	U	0.94	U	0.82	U	0.91	U	0.97	U	0.9	U	0.97	U	0.87	U	0.91	U
Vanadium	21		13.8		22.1		24.8		27.6		16.8		17.4		21.6		20.8		14.3		18.2		11.7		17.7	
Zinc	66.3		110		1,670		465		2,550		1,660		146		1,280		94.3		25.3		117		149		210	
Wet Chemistry (mg/kg)																									
Total organic carbon (TOC)	NA		NA		40,000		NA		NA		NA		NA		NA		NA		NA		NA		120,000		150,000	
pH	NA		NA		7.2		NA		NA		NA		NA		NA		NA		NA		NA		6.9		7	

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Indian Head, Maryland

Station ID	IS53SS11		IS53SS12		IS53SS13		IS53SS14		IS53SS15		IS53SS16		IS53SS17		IS53SS18		IS53SS19		IS53SS20			
Sample ID	IS53SS110001		IS53SS120001		IS53SS130001		IS53SS140001		IS53SS150001		IS53SS160001		IS53SS170001		IS53SS180001		IS53SS190001		IS53SS200001		IS53SS20P0001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Volatile Organic Compounds (µg/kg)																						
1,1,1-Trichloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,1,2,2-Tetrachloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		23	B	NA		19	B	NA		NA		NA		7	B	8.5	B
1,1,2-Trichloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,1-Dichloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,1-Dichloroethene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2,4-Trichlorobenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2-Dibromoethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2-Dichlorobenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2-Dichloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,2-Dichloropropane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,3-Dichlorobenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
1,4-Dichlorobenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
2-Butanone	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
2-Hexanone	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
4-Methyl-2-pentanone	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Acetone	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	UJ
Benzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Bromodichloromethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Bromoform	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Bromomethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Carbon disulfide	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Carbon tetrachloride	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Chlorobenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Chloroethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Chloroform	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Chloromethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Cumene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Cyclohexane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Dibromochloromethane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Ethylbenzene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Methyl acetate	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Methylcyclohexane	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Methylene chloride	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	UJ
Styrene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Tetrachloroethene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Toluene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Trichloroethene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U

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Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Vinyl chloride	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Xylene, total	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
cis-1,2-Dichloroethene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
cis-1,3-Dichloropropene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
o-Xylene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
trans-1,2-Dichloroethene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
trans-1,3-Dichloropropene	NA		NA		NA		14	U	NA		12	U	NA		NA		NA		12	U	13	U
Semi-volatile Organic Compounds (µg/kg)																						
1,1-Biphenyl	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		58	J	420	UJ
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2,4,5-Trichlorophenol	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	UJ
2,4,6-Trichlorophenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2,4-Dichlorophenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2,4-Dimethylphenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2,4-Dinitrophenol	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	UJ
2-Chloronaphthalene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2-Chlorophenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2-Methylnaphthalene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		140	J	420	U
2-Methylphenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
2-Nitroaniline	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	UJ
2-Nitrophenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
3,3'-Dichlorobenzidine	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	UJ	420	UJ
3- and 4-Methylphenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
3-Nitroaniline	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	UJ
4,6-Dinitro-2-methylphenol	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	U
4-Bromophenyl-phenylether	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
4-Chloro-3-methylphenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
4-Chloroaniline	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
4-Chlorophenyl-phenylether	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
4-Nitroaniline	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	U
4-Nitrophenol	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	UJ
Acenaphthene	NA		NA		NA		110	J	NA		410	U	NA		NA		NA		1,200		190	J
Acenaphthylene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
Acetophenone	NA		NA		NA		260	J	NA		410	U	NA		NA		NA		400	U	420	UJ
Anthracene	NA		NA		NA		240	J	NA		410	U	NA		NA		NA		2,900		400	J
Atrazine	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Benzaldehyde	NA		NA		NA		420	J	NA		410	U	NA		NA		NA		400	UJ	420	UJ
Benzo(a)anthracene	NA		NA		NA		920		NA		140	J	NA		NA		NA		7,700		1,400	J
Benzo(a)pyrene	NA		NA		NA		1,100		NA		130	J	NA		NA		NA		6,300		1,100	J
Benzo(b)fluoranthene	NA		NA		NA		1,400		NA		190	J	NA		NA		NA		9,100		1,800	J
Benzo(g,h,i)perylene	NA		NA		NA		320	J	NA		41	J	NA		NA		NA		1,700		410	J
Benzo(k)fluoranthene	NA		NA		NA		650		NA		91	J	NA		NA		NA		2,800		830	J
Butylbenzylphthalate	NA		NA		NA		69	J	NA		410	U	NA		NA		NA		100	J	110	J

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Sample ID	IS53SS110001		IS53SS120001		IS53SS130001		IS53SS140001		IS53SS150001		IS53SS160001		IS53SS170001		IS53SS180001		IS53SS190001		IS53SS200001		IS53SS20P0001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Caprolactam	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		4,000	R	2,100	R
Carbazole	NA		NA		NA		170	J	NA		410	U	NA		NA		NA		1,600		210	J
Chrysene	NA		NA		NA		1,300		NA		160	J	NA		NA		NA		7,900	D	1,400	J
Di-n-butylphthalate	NA		NA		NA		51	J	NA		410	U	NA		NA		NA		87	J	240	J
Di-n-octylphthalate	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	UJ	420	UJ
Dibenz(a,h)anthracene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		220	J	47	J
Dibenzofuran	NA		NA		NA		100	J	NA		410	U	NA		NA		NA		600		68	J
Diethylphthalate	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		110	J	420	UJ
Dimethyl phthalate	NA		NA		NA		450	J	NA		410	U	NA		NA		NA		400	U	420	UJ
Fluoranthene	NA		NA		NA		2,800		NA		400	J	NA		NA		NA		17,000		3,200	
Fluorene	NA		NA		NA		160	J	NA		410	U	NA		NA		NA		1,100		160	J
Hexachlorobenzene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Hexachlorobutadiene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Hexachlorocyclopentadiene	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Hexachloroethane	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
Indeno(1,2,3-cd)pyrene	NA		NA		NA		320	J	NA		44	J	NA		NA		NA		1,900		410	J
Isophorone	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Naphthalene	NA		NA		NA		70	J	NA		410	U	NA		NA		NA		350	J	420	U
Pentachlorophenol	NA		NA		NA		1,200	U	NA		1,000	U	NA		NA		NA		990	U	1,100	U
Phenanthrene	NA		NA		NA		2,100		NA		230	J	NA		NA		NA		13,000		2,100	
Phenol	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
Pyrene	NA		NA		NA		2,300		NA		310	J	NA		NA		NA		14,000		2,900	
bis(2-Chloroethoxy)methane	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
bis(2-Chloroethyl)ether	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	UJ
bis(2-Ethylhexyl)phthalate	NA		NA		NA		1,200		NA		410	U	NA		NA		NA		340	J	360	J
n-Nitroso-di-n-propylamine	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
n-Nitrosodiphenylamine	NA		NA		NA		480	U	NA		410	U	NA		NA		NA		400	U	420	U
Explosives (µg/kg)																						
1,3,5-Trinitrobenzene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	590	UJ	630	UJ
1,3-Dinitrobenzene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	590	UJ	630	UJ
2,4,6-Trinitrotoluene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	590	UJ	630	UJ
2,4-Dinitrotoluene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	400	U	420	UJ
2,6-Dinitrotoluene	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	400	U	420	UJ
2-Amino-4,6-dinitrotoluene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	590	UJ	630	UJ
2-Nitrotoluene	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
3-Nitrotoluene	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
4-Amino-2,6-dinitrotoluene	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
4-Nitrotoluene	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
HMX	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	590	UJ	630	UJ
Nitrobenzene	700	UJ	590	UJ	580	UJ	700	UJ	600	UJ	600	UJ	550	UJ	560	UJ	600	UJ	400	U	420	UJ
Nitrocellulose	5,700		3,000	U	4,200		3,600	U	7,200		3,100	U	2,800	U	2,800	U	3,000	U	3,000	U	3,200	U
Nitroglycerin	70,000	U	59,000	U	58,000	U	70,000	U	60,000	U	60,000	U	55,000	U	56,000	U	60,000	U	59,000	U	63,000	U
Nitroguanidine	140,000	U	120,000	U	120,000	U	140,000	U	120,000	U	120,000	U	110,000	U	110,000	U	120,000	U	120,000	U	130,000	U

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Station ID	IS53SS11		IS53SS12		IS53SS13		IS53SS14		IS53SS15		IS53SS16		IS53SS17		IS53SS18		IS53SS19		IS53SS20			
Sample ID	IS53SS110001		IS53SS120001		IS53SS130001		IS53SS140001		IS53SS150001		IS53SS160001		IS53SS170001		IS53SS180001		IS53SS190001		IS53SS200001		IS53SS20P0001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
PETN	70,000	U	59,000	U	58,000	U	70,000	U	60,000	U	60,000	U	55,000	U	56,000	U	60,000	U	59,000	U	63,000	U
RDX	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
Tetryl	700	U	590	U	580	U	700	U	600	U	600	U	550	U	560	U	600	U	590	U	630	U
Total Metals (mg/kg)																						
Aluminum	2,170		1,910		3,540		2,320		2,420		3,850		797		4,450		1,990		3,550		6,120	
Antimony	0.86	U	0.72	U	0.71	U	0.86	U	1.3	J	0.91	J	0.7	U	0.69	U	0.74	U	0.72	U	0.78	U
Arsenic	12.2		13.7		7.1		39.6		21.6		6.8		2.7		2.1	J	2.8		5.7		5.7	
Barium	71.7		59.8		41.8	J	54.7	J	65.4		33.3	J	13.9	J	33.8	J	32.9	J	22.6	J	32.7	J
Beryllium	0.43	J	0.36	J	0.33	J	0.42	J	0.38	J	0.33	J	0.13	J	0.23	J	0.24	J	0.27	J	0.37	J
Cadmium	0.48	J	0.31	J	0.25	J	15.7		3.4		0.44	J	0.09	U	0.09	U	0.43	J	1.7		2.3	
Calcium	921	J	1,280		1,490		1,750		968	J	3,680		998	J	1,490		1,210		2,760		3,050	
Chromium	6.6		7.3		8.1		11.6		13.7		10.1		3.6		13.2		11.4		10.4		24.2	
Cobalt	4.2	J	6.1	J	2.9	J	3.8	J	3	J	2.6	J	1.2	J	1.9	J	5.5	J	3.6	J	6.4	J
Copper	20.3		22.2		9.9		33.3		73.8		10.1		18.2		7.6		10.6		18.7		24.4	
Cyanide	0.7	U	0.59	U	0.58	U	0.71	U	0.61	U	0.61	U	0.56	U	0.56	U	0.6	U	0.59	U	0.64	U
Iron	4,910		4,980		7,650		5,560		6,170		9,670		2,080		6,090		2,590		6,690		11,200	
Lead	1,000		1,050		213		463		481		68.5		92.7		18.9		157		151		192	
Magnesium	198	J	233	J	402	J	300	J	314	J	1,640		386	J	584	J	249	J	1,280		2,090	
Manganese	18.3		122		95.3		155		263		95.2		37.5		110		62.7		123		195	
Mercury	2		9.3		7.3		17.1		40.6		3.7		0.29		0.76		2		1.7		2	
Nickel	6.2	J	7.4	J	5.7	J	8	J	12.1		5.4	J	10.4		9.8		3.7	J	17.3		26.3	
Potassium	163	J	181	J	238	J	124	J	129	J	213	J	114	J	371	J	138	J	143	J	330	J
Selenium	1.3	J	0.75	U	0.89	J	0.89	U	0.76	U	0.79	U	0.72	U	0.72	U	0.76	U	0.74	U	0.81	U
Silver	0.36	U	0.3	U	0.46	J	0.9	J	0.38	J	0.55	J	0.29	U	0.29	U	0.31	U	0.3	U	0.42	J
Sodium	73.8	U	62.3	U	61.6	U	122	J	64.1	J	66.4	U	60.2	U	72.8	J	63.7	U	387	J	539	J
Thallium	1.1	U	0.94	J	1.5	J	1.1	U	0.93	U	0.97	U	0.88	U	0.87	U	0.93	U	0.91	U	1	J
Vanadium	33.6		21.6		19.9		17.7		17.7		22		13		10.9	J	11.7	J	23.5		37	
Zinc	190		211		91.9		219		234		40.1		55.4		38.9		100		88.8		149	
Wet Chemistry (mg/kg)																						
Total organic carbon (TOC)	NA		NA		NA		NA		NA		33,000		NA		NA		NA		NA		NA	
pH	NA		NA		NA		NA		NA		7.06		NA		NA		NA		NA		NA	

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS21	IS53SS22	IS53SS23	IS53SS24	IS53SS25	IS53SS26		IS53SS27	IS53SS28	IS53SS29	IS53SS30
Sample ID	IS53SS210001	IS53SS220001	IS53SS230001	IS53SS240001	IS53SS250001	IS53SS260001	IS53SS26P0001	IS53SS270001	IS53SS280001	IS53SS290001	IS53SS300001
Sample Date	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Chemical Name											
Volatile Organic Compounds (µg/kg)											
1,1,1-Trichloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	6.2 B	NA	NA	NA	NA	6.3 B	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,1-Dichloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,1-Dichloroethene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2-Dibromoethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2-Dichloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,2-Dichloropropane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
2-Butanone	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
2-Hexanone	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Acetone	NA	NA	NA	12 UJ	NA	NA	NA	NA	12 UJ	NA	NA
Benzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Bromodichloromethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Bromoform	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Bromomethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Carbon disulfide	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Carbon tetrachloride	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Chlorobenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Chloroethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Chloroform	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Chloromethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Cumene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Cyclohexane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Dibromochloromethane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Ethylbenzene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Methyl acetate	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Methylcyclohexane	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Methylene chloride	NA	NA	NA	12 UJ	NA	NA	NA	NA	12 UJ	NA	NA
Styrene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Tetrachloroethene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Toluene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Trichloroethene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA

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Indian Head, Maryland

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Sample ID	IS53SS210001	IS53SS220001	IS53SS230001	IS53SS240001	IS53SS250001	IS53SS260001	IS53SS26P0001	IS53SS270001	IS53SS280001	IS53SS290001	IS53SS300001
Sample Date	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01	05/01/01
Chemical Name											
Vinyl chloride	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Xylene, total	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
o-Xylene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	12 U	NA	NA	NA	NA	12 U	NA	NA
Semi-volatile Organic Compounds (µg/kg)											
1,1-Biphenyl	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2,4-Dichlorophenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2,4-Dimethylphenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2,4-Dinitrophenol	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
2-Chloronaphthalene	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2-Chlorophenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2-Methylnaphthalene	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2-Methylphenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
2-Nitroaniline	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
2-Nitrophenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	400 UJ	NA	NA	NA	NA	380 U	NA	NA
3- and 4-Methylphenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
3-Nitroaniline	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
4-Chloroaniline	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
4-Nitroaniline	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
4-Nitrophenol	NA	NA	NA	1,000 U	NA	NA	NA	NA	960 U	NA	NA
Acenaphthene	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
Acenaphthylene	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
Acetophenone	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
Anthracene	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
Atrazine	NA	NA	NA	400 U	NA	NA	NA	NA	380 U	NA	NA
Benzaldehyde	NA	NA	NA	400 UJ	NA	NA	NA	NA	380 UJ	NA	NA
Benzo(a)anthracene	NA	NA	NA	91 J	NA	NA	NA	NA	170 J	NA	NA
Benzo(a)pyrene	NA	NA	NA	89 J	NA	NA	NA	NA	160 J	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	130 J	NA	NA	NA	NA	180 J	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	400 UJ	NA	NA	NA	NA	70 J	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	89 J	NA	NA	NA	NA	96 J	NA	NA
Butylbenzylphthalate	NA	NA	NA	81 J	NA	NA	NA	NA	190 J	NA	NA

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Station ID	IS53SS21		IS53SS22		IS53SS23		IS53SS24		IS53SS25		IS53SS26		IS53SS26		IS53SS27		IS53SS28		IS53SS29		IS53SS30	
Sample ID	IS53SS210001		IS53SS220001		IS53SS230001		IS53SS240001		IS53SS250001		IS53SS260001		IS53SS26P0001		IS53SS270001		IS53SS280001		IS53SS290001		IS53SS300001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Caprolactam	NA		NA		NA		400	R	NA		NA		NA		NA		380	R	NA		NA	
Carbazole	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Chrysene	NA		NA		NA		100	J	NA		NA		NA		NA		200	J	NA		NA	
Di-n-butylphthalate	NA		NA		NA		170	J	NA		NA		NA		NA		250	J	NA		NA	
Di-n-octylphthalate	NA		NA		NA		400	UJ	NA		NA		NA		NA		380	U	NA		NA	
Dibenz(a,h)anthracene	NA		NA		NA		400	UJ	NA		NA		NA		NA		380	U	NA		NA	
Dibenzofuran	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Diethylphthalate	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Dimethyl phthalate	NA		NA		NA		400	U	NA		NA		NA		NA		200	J	NA		NA	
Fluoranthene	NA		NA		NA		140	J	NA		NA		NA		NA		270	J	NA		NA	
Fluorene	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Hexachlorobenzene	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Hexachlorobutadiene	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Hexachlorocyclopentadiene	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Hexachloroethane	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Indeno(1,2,3-cd)pyrene	NA		NA		NA		43	J	NA		NA		NA		NA		66	J	NA		NA	
Isophorone	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Naphthalene	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Pentachlorophenol	NA		NA		NA		1,000	U	NA		NA		NA		NA		960	U	NA		NA	
Phenanthrene	NA		NA		NA		68	J	NA		NA		NA		NA		150	J	NA		NA	
Phenol	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Pyrene	NA		NA		NA		220	J	NA		NA		NA		NA		360	J	NA		NA	
bis(2-Chloroethoxy)methane	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
bis(2-Chloroethyl)ether	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
bis(2-Ethylhexyl)phthalate	NA		NA		NA		140	J	NA		NA		NA		NA		160	J	NA		NA	
n-Nitroso-di-n-propylamine	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
n-Nitrosodiphenylamine	NA		NA		NA		400	U	NA		NA		NA		NA		380	U	NA		NA	
Explosives (µg/kg)																						
1,3,5-Trinitrobenzene	680	UJ	600	UJ	580	UJ	600	UJ	560	UJ	720	UJ	690	UJ	600	UJ	580	UJ	540	UJ	570	UJ
1,3-Dinitrobenzene	680	UJ	600	UJ	580	UJ	600	UJ	560	UJ	720	UJ	690	UJ	600	UJ	580	UJ	540	UJ	570	UJ
2,4,6-Trinitrotoluene	680	UJ	600	UJ	580	UJ	600	UJ	560	UJ	720	UJ	690	UJ	600	UJ	580	UJ	540	UJ	570	UJ
2,4-Dinitrotoluene	680	UJ	600	UJ	580	UJ	400	U	560	UJ	720	UJ	690	UJ	600	UJ	380	U	540	UJ	570	UJ
2,6-Dinitrotoluene	680	U	600	U	580	U	400	U	560	U	720	U	690	U	600	U	380	U	540	U	570	U
2-Amino-4,6-dinitrotoluene	680	UJ	600	UJ	580	UJ	600	UJ	560	UJ	720	UJ	690	UJ	600	UJ	580	UJ	540	UJ	570	UJ
2-Nitrotoluene	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
3-Nitrotoluene	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
4-Amino-2,6-dinitrotoluene	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
4-Nitrotoluene	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
HMX	680	UJ	600	UJ	580	UJ	600	UJ	560	UJ	720	UJ	690	UJ	600	UJ	580	UJ	540	UJ	570	UJ
Nitrobenzene	680	UJ	600	UJ	580	UJ	400	U	560	UJ	720	UJ	690	UJ	600	UJ	380	U	540	UJ	570	UJ
Nitrocellulose	3,400	U	3,000	U	3,000	U	3,000	U	2,900	U	3,600	U	3,500	U	3,100	U	2,900	U	2,800	U	2,900	U
Nitroglycerin	68,000	U	60,000	U	58,000	U	60,000	U	56,000	U	72,000	U	69,000	U	60,000	U	58,000	U	54,000	U	57,000	U
Nitroguanidine	130,000	U	120,000	U	120,000	U	120,000	U	110,000	U	140,000	U	140,000	U	120,000	U	120,000	U	110,000	U	110,000	U

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Indian Head, Maryland

Station ID	IS53SS21		IS53SS22		IS53SS23		IS53SS24		IS53SS25		IS53SS26		IS53SS26		IS53SS27		IS53SS28		IS53SS29		IS53SS30	
Sample ID	IS53SS210001		IS53SS220001		IS53SS230001		IS53SS240001		IS53SS250001		IS53SS260001		IS53SS26P0001		IS53SS270001		IS53SS280001		IS53SS290001		IS53SS300001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
PETN	68,000	U	60,000	U	58,000	U	60,000	U	56,000	U	72,000	U	69,000	U	60,000	U	58,000	U	54,000	U	57,000	U
RDX	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
Tetryl	680	U	600	U	580	U	600	U	560	U	720	U	690	U	600	U	580	U	540	U	570	U
Total Metals (mg/kg)																						
Aluminum	4,630		4,940		8,330		5,480		4,060		4,420		4,380		12,000		6,470		11,900		7,400	
Antimony	0.85	U	0.8	J	0.72	U	0.73	U	1.1	J	7.3	J	8.3	J	0.74	U	17.8		0.68	U	0.71	U
Arsenic	10.9		4.3		4		5.4		13.8		62.4		66.1		5.9		10.1		6		8.8	
Barium	41.3	J	55.2		46.6		50.4		124		272		308		62.7		131		58.6		68.4	
Beryllium	0.44	J	0.37	J	0.39	J	0.34	J	0.25	J	0.36	J	0.39	J	0.43	J	0.39	J	0.42	J	0.49	J
Cadmium	0.11	U	0.24	J	0.09	U	6.8		2.1		25.5		31.2		0.78	J	1.9		0.31	J	0.73	J
Calcium	3,150		4,710		1,560		12,800		7,310		5,750		9,490		3,740		3,150		1,590		1,810	
Chromium	12.9		16.3		13.1		17.9		55.2		51.5		124		33.4		41		19.7		15.6	
Cobalt	3.6	J	4.6	J	4.2	J	17.7		8.9	J	12.1	J	13.3	J	6.2	J	8.4	J	5.5	J	7.3	J
Copper	17		68.1		5.9		24.6		23.9		156		674		19.3		27.8		68.8		65.6	
Cyanide	0.69	U	0.6	U	0.6	U	0.6	U	0.57	U	1.4		0.69	U	0.62	U	0.64		0.55	U	0.57	U
Iron	9,270		9,500		13,300		12,400		7,850		20,900		32,600		16,900		12,600		15,200		11,800	
Lead	76.1		192		14.9		493		2,100		21,800		31,200		427		786		109		142	
Magnesium	1,020	J	2,280		518	J	3,940		5,120		1,400	J	1,650		1,800		1,340		918	J	723	J
Manganese	137		241		142		271		141		313		380		259		188		127		408	
Mercury	0.13	U	0.78		0.12		3.4		3.5		16.4		21.6		1.7		13.6		2.5		21.4	
Nickel	11.7		7.6	J	3.7	J	45.6		34.4		24.5		21.6		8.8	J	16.5		8.7	J	15.9	
Potassium	207	J	334	J	290	J	300	J	162	J	403	J	441	J	571	J	425	J	709	J	407	J
Selenium	0.87	U	0.77	U	0.74	U	0.76	U	0.72	U	0.92	U	1.2	J	0.77	U	0.72	U	0.7	U	0.73	U
Silver	0.35	U	0.4	J	0.3	U	0.77	J	0.55	J	1.2	J	2	J	0.31	U	3.5		0.41	J	0.83	J
Sodium	104	J	64.3	U	62.1	U	503	J	244	J	1,390	J	1,470		208	J	146	J	63.3	J	90.6	J
Thallium	1.1	U	0.94	U	0.91	U	0.92	U	0.88	U	1.1	U	1.1	U	0.93	U	0.88	U	0.86	U	0.89	U
Vanadium	25.7		26.9		24.4		33.5		18		27		29.3		30		26.1		27.7		27.8	
Zinc	78.4		126		34.7		604		1,590		5,770		6,000		1,080		808		184		230	
Wet Chemistry (mg/kg)																						
Total organic carbon (TOC)	NA		NA		NA		27,000		NA		NA		NA		NA		NA		NA		NA	
pH	NA		NA		NA		8.7		NA		NA		NA		NA		NA		NA		NA	

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L-Biased low
R-Rejected
U-Not Detected
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UL-not detected, biased low

Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS31		IS53SS32		IS53SS33		IS53SS34		IS53SS35		IS53SS35		IS53SS36		IS53SS37		IS53SS38		IS53SS39		IS53SS40	
Sample ID	IS53SS310001		IS53SS320001		IS53SS330001		IS53SS340001		IS53SS35P0001		IS53SS350001		IS53SS360001		IS53SS370001		IS53SS380001		IS53SS390001		IS53SS400001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Volatile Organic Compounds (µg/kg)																						
1,1,1-Trichloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,1,2,2-Tetrachloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		6.3	B	6.4	B	6.5	B	NA		NA		21	B	NA	
1,1,2-Trichloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,1-Dichloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,1-Dichloroethene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2,4-Trichlorobenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2-Dibromoethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2-Dichlorobenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2-Dichloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,2-Dichloropropane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,3-Dichlorobenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
1,4-Dichlorobenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
2-Butanone	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
2-Hexanone	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
4-Methyl-2-pentanone	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Acetone	NA		NA		NA		NA		11	UJ	11	UJ	12	UJ	NA		NA		12	U	NA	
Benzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Bromodichloromethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Bromoform	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Bromomethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Carbon disulfide	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Carbon tetrachloride	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Chlorobenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Chloroethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Chloroform	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Chloromethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Cumene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Cyclohexane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Dibromochloromethane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Ethylbenzene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Methyl acetate	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Methylcyclohexane	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Methylene chloride	NA		NA		NA		NA		11	UJ	11	UJ	12	UJ	NA		NA		12	U	NA	
Styrene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Tetrachloroethene	NA		NA		NA		NA		4.4	J	11	U	12	U	NA		NA		12	U	NA	
Toluene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Trichloroethene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Trichlorofluoromethane(Freon-11)	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS31		IS53SS32		IS53SS33		IS53SS34		IS53SS35		IS53SS35		IS53SS36		IS53SS37		IS53SS38		IS53SS39		IS53SS40	
Sample ID	IS53SS310001		IS53SS320001		IS53SS330001		IS53SS340001		IS53SS35P0001		IS53SS350001		IS53SS360001		IS53SS370001		IS53SS380001		IS53SS390001		IS53SS400001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Vinyl chloride	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Xylene, total	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
cis-1,2-Dichloroethene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
cis-1,3-Dichloropropene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
o-Xylene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
trans-1,2-Dichloroethene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
trans-1,3-Dichloropropene	NA		NA		NA		NA		11	U	11	U	12	U	NA		NA		12	U	NA	
Semi-volatile Organic Compounds (µg/kg)																						
1,1-Biphenyl	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2,4,5-Trichlorophenol	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
2,4,6-Trichlorophenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2,4-Dichlorophenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2,4-Dimethylphenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2,4-Dinitrophenol	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
2-Chloronaphthalene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2-Chlorophenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2-Methylnaphthalene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2-Methylphenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
2-Nitroaniline	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
2-Nitrophenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
3,3'-Dichlorobenzidine	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
3- and 4-Methylphenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
3-Nitroaniline	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
4,6-Dinitro-2-methylphenol	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
4-Bromophenyl-phenylether	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
4-Chloro-3-methylphenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
4-Chloroaniline	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
4-Chlorophenyl-phenylether	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
4-Nitroaniline	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
4-Nitrophenol	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
Acenaphthene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Acenaphthylene	NA		NA		NA		NA		350	U	370	U	53	J	NA		NA		390	U	NA	
Acetophenone	NA		NA		NA		NA		350	U	370	U	100	J	NA		NA		46	J	NA	
Anthracene	NA		NA		NA		NA		350	U	370	U	53	J	NA		NA		160	J	NA	
Atrazine	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Benzaldehyde	NA		NA		NA		NA		350	UJ	370	U	390	UJ	NA		NA		390	U	NA	
Benzo(a)anthracene	NA		NA		NA		NA		270	J	110	J	300	J	NA		NA		1,500		NA	
Benzo(a)pyrene	NA		NA		NA		NA		250	J	130	J	320	J	NA		NA		1,100		NA	
Benzo(b)fluoranthene	NA		NA		NA		NA		350	J	180	J	460		NA		NA		1,800		NA	
Benzo(g,h,i)perylene	NA		NA		NA		NA		87	J	65	J	110	J	NA		NA		250	J	NA	
Benzo(k)fluoranthene	NA		NA		NA		NA		210	J	89	J	220	J	NA		NA		950		NA	
Butylbenzylphthalate	NA		NA		NA		NA		60	J	51	J	620		NA		NA		210	J	NA	

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Indian Head, Maryland

Station ID	IS53SS31		IS53SS32		IS53SS33		IS53SS34		IS53SS35		IS53SS35		IS53SS36		IS53SS37		IS53SS38		IS53SS39		IS53SS40	
Sample ID	IS53SS310001		IS53SS320001		IS53SS330001		IS53SS340001		IS53SS35P0001		IS53SS350001		IS53SS360001		IS53SS370001		IS53SS380001		IS53SS390001		IS53SS400001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
Caprolactam	NA		NA		NA		NA		1,800	R	1,800	R	390	R	NA		NA		390	R	NA	
Carbazole	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		130	J	NA	
Chrysene	NA		NA		NA		NA		260	J	120	J	390	J	NA		NA		1,600		NA	
Di-n-butylphthalate	NA		NA		NA		NA		9,700		8,800		270	J	NA		NA		59	J	NA	
Di-n-octylphthalate	NA		NA		NA		NA		350	U	370	UJ	390	U	NA		NA		390	U	NA	
Dibenz(a,h)anthracene	NA		NA		NA		NA		350	UJ	370	UJ	390	U	NA		NA		390	U	NA	
Dibenzofuran	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Diethylphthalate	NA		NA		NA		NA		210	J	47	J	390	U	NA		NA		46	J	NA	
Dimethyl phthalate	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Fluoranthene	NA		NA		NA		NA		410		190	J	580		NA		NA		2,500		NA	
Fluorene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Hexachlorobenzene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Hexachlorobutadiene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Hexachlorocyclopentadiene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Hexachloroethane	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Indeno(1,2,3-cd)pyrene	NA		NA		NA		NA		85	J	55	J	110	J	NA		NA		300	J	NA	
Isophorone	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Naphthalene	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Pentachlorophenol	NA		NA		NA		NA		890	U	920	U	970	U	NA		NA		970	U	NA	
Phenanthrene	NA		NA		NA		NA		88	J	68	J	220	J	NA		NA		740		NA	
Phenol	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Pyrene	NA		NA		NA		NA		610		300	J	590		NA		NA		2,600		NA	
bis(2-Chloroethoxy)methane	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
bis(2-Chloroethyl)ether	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
bis(2-Ethylhexyl)phthalate	NA		NA		NA		NA		1,600		960		630		NA		NA		340	J	NA	
n-Nitroso-di-n-propylamine	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
n-Nitrosodiphenylamine	NA		NA		NA		NA		350	U	370	U	390	U	NA		NA		390	U	NA	
Explosives (µg/kg)																						
1,3,5-Trinitrobenzene	680	UJ	670	UJ	570	UJ	580	UJ	530	UJ	540	UJ	570	UJ	550	U	620	U	560	U	560	U
1,3-Dinitrobenzene	680	UJ	670	UJ	570	UJ	580	UJ	530	UJ	540	UJ	570	UJ	550	U	620	U	560	U	560	U
2,4,6-Trinitrotoluene	680	UJ	670	UJ	570	UJ	580	UJ	530	UJ	540	UJ	570	UJ	550	U	620	U	560	U	560	U
2,4-Dinitrotoluene	680	UJ	670	UJ	570	UJ	580	UJ	61	J	130	J	390	U	550	U	620	U	560	U	560	U
2,6-Dinitrotoluene	680	U	670	U	570	U	580	U	350	U	370	U	390	U	550	U	620	U	560	U	560	U
2-Amino-4,6-dinitrotoluene	680	UJ	670	UJ	570	U	580	UJ	530	UJ	540	UJ	570	UJ	550	U	620	U	560	U	560	U
2-Nitrotoluene	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
3-Nitrotoluene	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
4-Amino-2,6-dinitrotoluene	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
4-Nitrotoluene	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
HMX	680	UJ	670	UJ	268,364	J	580	UJ	530	UJ	540	UJ	570	UJ	550	U	620	U	560	U	560	U
Nitrobenzene	680	UJ	670	UJ	570	UJ	580	UJ	350	U	370	U	390	U	550	U	620	U	560	U	560	U
Nitrocellulose	3,400		5,700		NA		15,000		13,000		14,000		2,900	U	4,700		3,100	U	2,900	U	2,900	U
Nitroglycerin	68,000	U	67,000	U	57,000	U	58,000	U	53,000	U	54,000	U	57,000	U	55,000	U	62,000	U	56,000	U	56,000	U
Nitroguanidine	140,000	U	130,000	U	110,000	U	120,000	U	110,000	U	110,000	U	110,000	U	110,000	U	120,000	U	110,000	U	110,000	U

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D-Diluted sample
J-Estimated
K-Reported value may be biased high

L-Biased low
R-Rejected
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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS31		IS53SS32		IS53SS33		IS53SS34		IS53SS35		IS53SS35		IS53SS36		IS53SS37		IS53SS38		IS53SS39		IS53SS40	
Sample ID	IS53SS310001		IS53SS320001		IS53SS330001		IS53SS340001		IS53SS35P0001		IS53SS350001		IS53SS360001		IS53SS370001		IS53SS380001		IS53SS390001		IS53SS400001	
Sample Date	05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01		05/01/01	
Chemical Name																						
PETN	68,000	U	67,000	U	57,000	U	58,000	U	53,000	U	54,000	U	57,000	U	55,000	U	62,000	U	56,000	U	56,000	U
RDX	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
Tetryl	680	U	670	U	570	U	580	U	530	U	540	U	570	U	550	U	620	U	560	U	560	U
Total Metals (mg/kg)																						
Aluminum	6,870		8,960		8,270		7,000		7,340		2,670		5,280		3,470		6,020		3,230		6,640	
Antimony	1.9	J	3.1	J	2.3	J	1.3	J	2.1	J	2.2	J	1.6	J	1.1	J	1.9	J	4.4	J	0.71	U
Arsenic	29.8		63.1		42.4		8.1		9.6		6		8.4		8.7		7.5		3.3		6.5	
Barium	52.3	J	112		76.6		99.7		44		28.2	J	46.8		40.2	J	109		30.3	J	59.9	
Beryllium	0.47	J	0.63	J	0.61	J	0.6	J	0.49	J	0.33	J	0.47	J	0.29	J	0.46	J	0.34	J	0.57	J
Cadmium	0.59	J	16.2		2.4		2.6		1.3		1	J	0.73	J	1.6		0.8	J	1.3		0.11	J
Calcium	1,750		4,730		2,840		2,760		28,700		69,400		2,130		1,500		2,560		2,020		2,000	
Chromium	17.9		36.6		25.4		17.6		58.4		37.6		15.4		19.1		15.4		11.2		12.4	
Cobalt	6.6	J	10.6	J	9	J	6.8	J	12		7.7	J	5.1	J	2.6	J	2.9	J	2.3	J	4	J
Copper	27.7		123		339		70.2		59.5		44.9		60.7		37		62.6		14.7		14.8	
Cyanide	0.68	U	0.68	U	0.58	U	0.59	U	0.53	U	0.55	U	0.58	U	0.55	U	0.63	U	0.58	U	0.57	U
Iron	21,700		18,800		19,900		14,100		13,500		5,790		9,380		7,230		12,200		6,610		13,700	
Lead	195		387		1,190		445		195		144		187		207		471		620		120	
Magnesium	1,080	J	1,160	J	856	J	1,030	J	5,390		7,770		809	J	613	J	618	J	516	J	611	J
Manganese	231		492		467		429		306		214		231		88.4		118		76.9		131	
Mercury	43.6		177		52.3		66.8		36.5		17.3		53.9		51.3	L	4.7	L	2.3	L	0.8	L
Nickel	6.3	J	19.3		11.3		10.9		69		38.7		12.7		7.6	J	7.1	J	6.1	J	8	J
Potassium	445	J	745	J	615	J	503	J	614	J	366	J	378	J	276	J	256	J	176	J	324	J
Selenium	0.87	U	1.1	J	0.72	U	0.74	U	0.68	U	0.68	U	0.75	U	0.7	U	0.79	U	0.83	J	0.73	U
Silver	0.9	J	1.6	J	1.9	J	19.6		4.4		4.6		0.86	J	3		0.32	U	0.52	J	0.38	J
Sodium	72.5	U	130	J	159	J	62	U	110	J	56.7	U	67.1	J	96.8	J	66	U	84.7	J	61.2	U
Thallium	1.1	U	1	U	1	J	0.9	U	0.83	U	0.83	U	0.91	U	0.86	U	0.96	U	0.9	U	0.89	U
Vanadium	23.3		32		33.3		23.4		31.7		17.1		24		15.7		24.1		15.5		28.3	
Zinc	448		835		1,310		231		464		275		371		497		410		207		138	
Wet Chemistry (mg/kg)																						
Total organic carbon (TOC)	NA		NA		NA		NA		38,000		30,000		NA		NA		NA		38,000		NA	
pH	NA		NA		NA		NA		8.6		8.2		NA		NA		NA		7.3		NA	

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS41		IS53SS42	IS53SS43	IS53SS44		IS53SS45	IS53SS46	IS53SS47	IS53SS48	IS53SS49		IS53SS50
Sample ID	IS53SS410001	IS53SS41P0001	IS53SS420001	IS53SS430001	IS53SS440001		IS53SS450001	IS53SS460001	IS53SS470001	IS53SS480001	IS53SS490001		IS53SS500001
Sample Date	05/01/01	05/01/01	05/02/01	05/02/01	05/02/01		05/02/01	05/02/01	05/02/01	05/02/01	05/02/01		05/02/01
Chemical Name													
Volatile Organic Compounds (µg/kg)													
1,1,1-Trichloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	19	B	NA	NA	NA	NA	19	B	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,1-Dichloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,1-Dichloroethene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2-Dibromoethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2-Dichloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,2-Dichloropropane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
2-Butanone	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
2-Hexanone	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Acetone	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Benzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Bromodichloromethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Bromoform	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Bromomethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Carbon disulfide	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Carbon tetrachloride	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Chlorobenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Chloroethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Chloroform	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Chloromethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Cumene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Cyclohexane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Dibromochloromethane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Ethylbenzene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Methyl acetate	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Methylcyclohexane	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Methylene chloride	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Styrene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Tetrachloroethene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Toluene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Trichloroethene	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	11	U	NA	NA	NA	NA	11	U	NA

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Surface Soil Raw Data
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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS41		IS53SS42	IS53SS43	IS53SS44	IS53SS45	IS53SS46	IS53SS47	IS53SS48	IS53SS49	IS53SS50
Sample ID	IS53SS410001	IS53SS41P0001	IS53SS420001	IS53SS430001	IS53SS440001	IS53SS450001	IS53SS460001	IS53SS470001	IS53SS480001	IS53SS490001	IS53SS500001
Sample Date	05/01/01	05/01/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name											
Vinyl chloride	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
Xylene, total	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
o-Xylene	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	11 U	NA	NA	NA	NA	11 U	NA
Semi-volatile Organic Compounds (µg/kg)											
1,1-Biphenyl	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2,4-Dichlorophenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2,4-Dinitrophenol	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
2-Chloronaphthalene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2-Chlorophenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2-Methylnaphthalene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2-Methylphenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
2-Nitroaniline	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
2-Nitrophenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
3- and 4-Methylphenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
3-Nitroaniline	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
4-Chloroaniline	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
4-Nitroaniline	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
4-Nitrophenol	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
Acenaphthene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Acenaphthylene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Acetophenone	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Anthracene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Atrazine	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Benzaldehyde	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Benzo(a)anthracene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	170 J	NA
Benzo(a)pyrene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	150 J	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	220 J	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	49 J	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	99 J	NA
Butylbenzylphthalate	NA	NA	NA	NA	380 U	NA	NA	NA	NA	42 J	NA

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS41		IS53SS42	IS53SS43	IS53SS44	IS53SS45	IS53SS46	IS53SS47	IS53SS48	IS53SS49	IS53SS50
Sample ID	IS53SS410001	IS53SS41P0001	IS53SS420001	IS53SS430001	IS53SS440001	IS53SS450001	IS53SS460001	IS53SS470001	IS53SS480001	IS53SS490001	IS53SS500001
Sample Date	05/01/01	05/01/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name											
Caprolactam	NA	NA	NA	NA	380 R	NA	NA	NA	NA	370 R	NA
Carbazole	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Chrysene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	170 J	NA
Di-n-butylphthalate	NA	NA	NA	NA	380 U	NA	NA	NA	NA	88 J	NA
Di-n-octylphthalate	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Dibenzofuran	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Diethylphthalate	NA	NA	NA	NA	43 J	NA	NA	NA	NA	370 U	NA
Dimethyl phthalate	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Fluoranthene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	280 J	NA
Fluorene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Hexachlorobenzene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Hexachlorobutadiene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Hexachloroethane	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	57 J	NA
Isophorone	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Naphthalene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Pentachlorophenol	NA	NA	NA	NA	950 U	NA	NA	NA	NA	930 U	NA
Phenanthrene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	110 J	NA
Phenol	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Pyrene	NA	NA	NA	NA	380 U	NA	NA	NA	NA	280 J	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	45 J	NA	NA	NA	NA	120 J	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	380 U	NA	NA	NA	NA	370 U	NA
Explosives (µg/kg)											
1,3,5-Trinitrobenzene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
1,3-Dinitrobenzene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
2,4,6-Trinitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
2,4-Dinitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
2,6-Dinitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
2-Amino-4,6-dinitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
2-Nitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
3-Nitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
4-Amino-2,6-dinitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
4-Nitrotoluene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
HMX	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
Nitrobenzene	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
Nitrocellulose	2,800 U	2,800 U	2,500 U	2,800 U	2,800 U	3,000 U	2,900 U	2,600 U	5,900	2,800 U	3,000
Nitroglycerin	56,000 U	55,000 U	48,000 U	55,000 U	55,000 U	57,000 U	55,000 U	51,000 U	51,000 U	55,000 U	56,000 U
Nitroguanidine	110,000 U	110,000 U	970,000 U	110,000 U	110,000 U	110,000 U	110,000 U	100,000 U	100,000 U	110,000 U	110,000 U

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Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS41		IS53SS42	IS53SS43	IS53SS44	IS53SS45	IS53SS46	IS53SS47	IS53SS48	IS53SS49	IS53SS50
Sample ID	IS53SS410001	IS53SS41P0001	IS53SS420001	IS53SS430001	IS53SS440001	IS53SS450001	IS53SS460001	IS53SS470001	IS53SS480001	IS53SS490001	IS53SS500001
Sample Date	05/01/01	05/01/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name											
PETN	56,000 U	55,000 U	48,000 U	55,000 U	55,000 U	57,000 U	55,000 U	51,000 U	51,000 U	55,000 U	56,000 U
RDX	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
Tetryl	560 U	550 U	480 U	550 U	550 U	570 U	550 U	510 U	510 U	550 U	560 U
Total Metals (mg/kg)											
Aluminum	3,480	2,660	2,420	7,890	4,690	8,780	5,380	4,140	5,190	5,220	6,580
Antimony	1.1 J	1.6 J	0.62 U	0.69 U	0.8 J	0.87 J	2.7 J	0.65 U	1.6 J	4.6 J	1.2 J
Arsenic	4.7	4.1	1.2 J	7.3	3.8	4.4	4.2	2.2	4.3	3.4	6.6
Barium	32.4 J	28.6 J	16.3 J	44.2 J	71.7	63.3	40.4 J	33.4 J	73.8	39.7 J	54.1
Beryllium	0.33 J	0.19 J	0.1 J	0.32 J	0.23 J	0.44 J	0.37 J	0.24 J	0.41 J	0.27 J	0.39 J
Cadmium	0.77 J	0.82 J	0.22 J	2.6	0.51 J	0.34 J	1.7	0.24 J	1.2	0.7 J	1.1 J
Calcium	5,380	6,260	16,000	7,210	1,280	2,120	3,320	1,450	2,160	2,590	1,890
Chromium	15	18.8	18.1	14.7	12.7	16.5	18.5	8.1	19.6	34	14.9
Cobalt	3.9 J	3.9 J	3.1 J	3.3 J	1.8 J	6.5 J	3.8 J	3.1 J	7.4 J	3.1 J	4.1 J
Copper	36.8	33	12.2	55.4	27	54.1	4,000	43	264	545	30.7
Cyanide	0.57 U	0.56 U	0.5 U	0.56 U	0.57 U	0.6 U	0.57 U	0.53 U	0.53 U	0.55 U	0.58 U
Iron	6,880	5,680	5,130	14,900	9,860	13,200	11,200	6,860	10,200	14,500	14,200
Lead	417	508	157	187	530	75	254	40.7	177	161	86
Magnesium	2,780	2,900	9,300	1,300	361 J	756 J	596 J	391 J	697 J	595 J	601 J
Manganese	165	148	65.4	254	62.8	243	195	138	307	107	166
Mercury	5.9 L	5.4 L	0.09 R	0.17 L	1.1 L	22.1 L	5.8 L	0.62 L	577 L	120 L	11.6 L
Nickel	16.1	12.7	25	10.7	4.1 J	7.8 J	8.4 J	4.2 J	8.5	9.4	8.6 J
Potassium	499 J	450 J	551 J	374 J	216 J	489 J	328 J	240 J	363 J	319 J	383 J
Selenium	0.71 U	0.7 U	0.64 U	0.71 U	0.72 U	0.76 U	0.73 U	0.67 U	0.68 U	0.7 U	0.72 U
Silver	0.38 J	0.36 J	0.26 U	0.29 U	0.62 J	0.99 J	1.4 J	0.45 J	1.5 J	0.82 J	0.78 J
Sodium	79.7 J	67.2 J	136 J	132 J	59.9 U	63.3 U	67.5 J	55.9 U	57 U	60.7 J	60.4 U
Thallium	0.87 U	0.86 U	0.78 U	1.1 J	0.87 U	0.92 U	0.89 U	0.81 U	0.83 U	0.86 U	1.3 J
Vanadium	16.2	12	26.3	30	18	26.4	21.6	13.2	20.6	18.2	26.7
Zinc	393	457	111	941	141	141	604	102	197	365	170
Wet Chemistry (mg/kg)											
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,000	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.7	NA

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Table E-1
Surface Soil Raw Data
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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS51		IS53SS52		IS53SS53		IS53SS54		IS53SS55		IS53SS56		IS53SS57		IS53SS58		IS53SS59		IS53SS60			IS53SS61	
Sample ID	IS53SS510001		IS53SS520001		IS53SS530001		IS53SS540001		IS53SS550001		IS53SS560001		IS53SS570001		IS53SS580001		IS53SS590001		IS53SS600001		IS53SS60P0001	IS53SS610001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	05/02/01	
Chemical Name																							
Volatile Organic Compounds (µg/kg)																							
1,1,1-Trichloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,1,2,2-Tetrachloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA		18	B	NA		NA		NA		NA		NA	21	B
1,1,2-Trichloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,1-Dichloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,1-Dichloroethene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2-Dibromoethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2-Dichlorobenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2-Dichloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,2-Dichloropropane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,3-Dichlorobenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
1,4-Dichlorobenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
2-Butanone	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
2-Hexanone	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
4-Methyl-2-pentanone	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Acetone	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	UJ
Benzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Bromodichloromethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Bromoform	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Bromomethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Carbon disulfide	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Carbon tetrachloride	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Chlorobenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Chloroethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Chloroform	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Chloromethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Cumene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Cyclohexane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Dibromochloromethane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Ethylbenzene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Methyl acetate	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Methylcyclohexane	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Methylene chloride	NA		NA		NA		NA		NA		6	B	NA		NA		NA		NA		NA	6.5	B
Styrene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Tetrachloroethene	NA		NA		NA		NA		NA		7.3	J	NA		NA		NA		NA		NA	10	U
Toluene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Trichloroethene	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		NA		NA		10	U	NA		NA		NA		NA		NA	10	U

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS51	IS53SS52	IS53SS53	IS53SS54	IS53SS55	IS53SS56	IS53SS57	IS53SS58	IS53SS59	IS53SS60		IS53SS61
Sample ID	IS53SS510001	IS53SS520001	IS53SS530001	IS53SS540001	IS53SS550001	IS53SS560001	IS53SS570001	IS53SS580001	IS53SS590001	IS53SS600001	IS53SS60P0001	IS53SS610001
Sample Date	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name												
Vinyl chloride	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
Xylene, total	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
o-Xylene	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	10 U
Semi-volatile Organic Compounds (µg/kg)												
1,1-Biphenyl	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2,4-Dichlorophenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2,4-Dinitrophenol	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
2-Chloronaphthalene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2-Chlorophenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2-Methylnaphthalene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2-Methylphenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
2-Nitroaniline	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
2-Nitrophenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
3- and 4-Methylphenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
3-Nitroaniline	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
4-Chloroaniline	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
4-Nitroaniline	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
4-Nitrophenol	NA	NA	NA	NA	NA	890 UJ	NA	NA	NA	NA	NA	860 U
Acenaphthene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Acenaphthylene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Acetophenone	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Anthracene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Atrazine	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Benzaldehyde	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Benzo(a)anthracene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Benzo(a)pyrene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	350 UJ	NA	NA	NA	NA	NA	340 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	350 U	NA	NA	NA	NA	NA	340 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	350 U	NA	NA	NA	NA	NA	340 U
Butylbenzylphthalate	NA	NA	NA	NA	NA	350 U	NA	NA	NA	NA	NA	340 U

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS51		IS53SS52		IS53SS53		IS53SS54		IS53SS55		IS53SS56		IS53SS57		IS53SS58		IS53SS59		IS53SS60				IS53SS61	
Sample ID	IS53SS510001		IS53SS520001		IS53SS530001		IS53SS540001		IS53SS550001		IS53SS560001		IS53SS570001		IS53SS580001		IS53SS590001		IS53SS600001		IS53SS60P0001		IS53SS610001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																								
Caprolactam	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Carbazole	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Chrysene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Di-n-butylphthalate	NA		NA		NA		NA		NA		100	J	NA		NA		NA		NA		NA		340	U
Di-n-octylphthalate	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Dibenz(a,h)anthracene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Dibenzofuran	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Diethylphthalate	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Dimethyl phthalate	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Fluoranthene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Fluorene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Hexachlorobenzene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Hexachlorobutadiene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Hexachlorocyclopentadiene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Hexachloroethane	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Indeno(1,2,3-cd)pyrene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Isophorone	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Naphthalene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Pentachlorophenol	NA		NA		NA		NA		NA		890	U	NA		NA		NA		NA		NA		860	U
Phenanthrene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Phenol	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Pyrene	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
bis(2-Chloroethoxy)methane	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
bis(2-Chloroethyl)ether	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
bis(2-Ethylhexyl)phthalate	NA		NA		NA		NA		NA		45	J	NA		NA		NA		NA		NA		340	U
n-Nitroso-di-n-propylamine	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
n-Nitrosodiphenylamine	NA		NA		NA		NA		NA		350	U	NA		NA		NA		NA		NA		340	U
Explosives (µg/kg)																								
1,3,5-Trinitrobenzene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	510	UJ
1,3-Dinitrobenzene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	510	UJ
2,4,6-Trinitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	510	UJ
2,4-Dinitrotoluene	510	U	650	U	540	U	640	U	570	U	350	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	340	U
2,6-Dinitrotoluene	510	U	650	U	540	U	640	U	570	U	350	UJ	580	U	590	U	550	U	540	U	560	U	340	U
2-Amino-4,6-dinitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	510	UJ
2-Nitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
3-Nitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
4-Amino-2,6-dinitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
4-Nitrotoluene	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
HMX	510	U	650	U	540	U	640	U	570	U	530	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	510	UJ
Nitrobenzene	510	U	650	U	540	U	640	U	570	U	350	UJ	580	UJ	590	UJ	550	UJ	540	UJ	560	UJ	340	U
Nitrocellulose	2,600	U	3,300	U	2,800	U	3,300	U	2,900	U	2,700	UJ	3,000	U	2,900	U	2,800	U	2,700	U	2,900	U	2,600	U
Nitroglycerin	51,000	U	65,000	U	54,000	U	64,000	U	57,000	U	53,000	UJ	58,000	U	59,000	U	55,000	U	54,000	U	56,000	U	51,000	U
Nitroguanidine	100,000	U	130,000	U	110,000	U	130,000	U	110,000	U	110,000	UJ	120,000	U	120,000	U	110,000	U	110,000	U	110,000	U	100,000	U

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L-Biased low
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Table E-1
Surface Soil Raw Data
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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS51		IS53SS52		IS53SS53		IS53SS54		IS53SS55		IS53SS56		IS53SS57		IS53SS58		IS53SS59		IS53SS60		IS53SS60		IS53SS61	
Sample ID	IS53SS510001		IS53SS520001		IS53SS530001		IS53SS540001		IS53SS550001		IS53SS560001		IS53SS570001		IS53SS580001		IS53SS590001		IS53SS600001		IS53SS60P0001		IS53SS610001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																								
PETN	51,000	U	65,000	U	54,000	U	64,000	U	57,000	U	53,000	UJ	58,000	U	59,000	U	55,000	U	54,000	U	56,000	U	51,000	U
RDX	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
Tetryl	510	U	650	U	540	U	640	U	570	U	530	UJ	580	U	590	U	550	U	540	U	560	U	510	U
Total Metals (mg/kg)																								
Aluminum	6,520		10,000		8,220		6,060		7,550		5,490		7,910		4,490		5,300		6,190		5,230		8,630	
Antimony	0.65	U	0.82	U	0.68	U	0.81	U	0.73	J	1.4	J	5.2	J	0.72	U	0.69	U	0.66	U	0.68	U	0.63	U
Arsenic	4.7		6.4		5.3		3.2		6.7		6.2		22.5		5		3.8		4.8		3.6		2	
Barium	44.4		42.3	J	46.9		24.4	J	51.4		139		799		44.8	J	39	J	42.6		42.8	J	12.1	J
Beryllium	0.35	J	0.39	J	0.33	J	0.24	J	0.38	J	0.52	B	0.35	B	0.3	B	0.32	B	0.41	B	0.34	B	0.16	B
Cadmium	0.11	J	0.11	U	0.09	U	0.1	U	0.42	J	3.8		5.8		0.15	J	0.09	U	0.09	U	0.1	J	0.08	U
Calcium	5,030		2,710		1,960		1,040	J	2,860		755	J	4,150		1,590		2,510		838	J	1,040	J	11,000	
Chromium	15.6		18.7		15.6		11.8		18.2		19.7		90.8		11.1		10		14.7		12.1		17	
Cobalt	3.8	J	3.4	J	3.4	J	1.4	J	5.8	J	8.3	J	8.2	J	2.6	J	2.2	J	4.6	J	4.2	J	7.9	J
Copper	26.4		18.6		14.5		88.9		34.3		364	J	27.1	J	8.8	J	7.1	J	14.8	J	16.5	J	64.2	J
Cyanide	0.53	U	0.66	U	0.55	U	0.66	U	0.58	U	0.53	UJ	0.83		0.59	U	0.56	U	0.55	U	0.57	U	0.51	U
Iron	11,500		21,900		22,300		11,800		16,200		9,470		14,500		8,680		9,080		14,600		11,200		8,400	
Lead	60.3		33.7		21.5		34.1		101		539		14,100		73.4		22.2		38		32.7		4.5	
Magnesium	2,770		777	J	670	J	288	J	1,250		748	J	2,040		310	J	507	J	586	J	578	J	6,510	
Manganese	159		103		94		51		295		646		332		143		65.8		270		166		147	
Mercury	0.65	L	2.1	L	0.83	L	0.36	L	0.48	L	0.1	UJ	0.37	K	0.2	K	0.1	U	0.1	U	0.1	U	0.94	K
Nickel	13.6		24.5		2.9	J	1.7	J	16.2		13.7		20.2		4.2	J	6.6	J	5.1	J	5.2	J	27.7	
Potassium	927	J	695	J	554	J	270	J	730	J	341	J	830	J	433	J	534	J	321	J	299	J	416	J
Selenium	0.68	U	0.85	U	0.97	J	0.83	U	0.72	U	0.67	UJ	0.89	J	0.74	U	0.71	U	0.68	U	0.7	U	0.65	U
Silver	0.27	U	0.46	J	0.3	J	0.39	J	0.3	J	1.4	J	1	J	0.3	U	0.29	U	0.37	J	0.38	J	0.26	U
Sodium	56.4	U	71.1	U	58.5	U	310	J	60.4	U	63.7	J	811	J	62	U	59.5	U	56.6	U	58.7	U	686	J
Thallium	0.82	U	1.4	J	1.6	J	1	U	0.88	U	0.81	UJ	1.1	J	0.9	U	0.87	U	0.98	J	0.86	U	0.79	U
Vanadium	19.8		32.6		28.6		22		35.4		16.6		38.2		19.5		16.1		24.3		19.4		13.3	
Zinc	87.8		69.2		112		28.9		106		541		4,040		48.2		40.3		123		172		47.7	
Wet Chemistry (mg/kg)																								
Total organic carbon (TOC)	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
pH	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS62		IS53SS63		IS53SS64		IS53SS65		IS53SS66		IS53SS66		IS53SS67		IS53SS68		IS53SS69		IS53SS70		IS53SS71	
Sample ID	IS53SS620001		IS53SS630001		IS53SS640001		IS53SS650001		IS53SS660001		IS53SS66P0001		IS53SS670001		IS53SS680001		IS53SS690001		IS53SS700001		IS53SS710001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																						
Volatile Organic Compounds (µg/kg)																						
1,1,1-Trichloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,1,2,2-Tetrachloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		24	B	NA		NA		NA		NA		NA		NA		28	B
1,1,2-Trichloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,1-Dichloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,1-Dichloroethene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2,4-Trichlorobenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2-Dibromo-3-chloropropane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2-Dibromoethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2-Dichlorobenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2-Dichloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,2-Dichloropropane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,3-Dichlorobenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
1,4-Dichlorobenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
2-Butanone	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
2-Hexanone	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
4-Methyl-2-pentanone	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Acetone	NA		NA		NA		11	UJ	NA		NA		NA		NA		NA		NA		12	UJ
Benzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Bromodichloromethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Bromoform	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Bromomethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Carbon disulfide	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Carbon tetrachloride	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Chlorobenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Chloroethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Chloroform	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Chloromethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Cumene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Cyclohexane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Dibromochloromethane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Ethylbenzene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Methyl acetate	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Methylcyclohexane	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Methylene chloride	NA		NA		NA		6.7	B	NA		NA		NA		NA		NA		NA		7.8	B
Styrene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Tetrachloroethene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		3.8	J
Toluene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Trichloroethene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Trichlorofluoromethane(Freon-11)	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS62		IS53SS63		IS53SS64		IS53SS65		IS53SS66		IS53SS66		IS53SS67		IS53SS68		IS53SS69		IS53SS70		IS53SS71	
Sample ID	IS53SS620001		IS53SS630001		IS53SS640001		IS53SS650001		IS53SS660001		IS53SS66P0001		IS53SS670001		IS53SS680001		IS53SS690001		IS53SS700001		IS53SS710001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																						
Vinyl chloride	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Xylene, total	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
cis-1,2-Dichloroethene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
cis-1,3-Dichloropropene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
o-Xylene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
trans-1,2-Dichloroethene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
trans-1,3-Dichloropropene	NA		NA		NA		11	U	NA		NA		NA		NA		NA		NA		12	U
Semi-volatile Organic Compounds (µg/kg)																						
1,1-Biphenyl	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2,4,5-Trichlorophenol	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
2,4,6-Trichlorophenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2,4-Dichlorophenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2,4-Dimethylphenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2,4-Dinitrophenol	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
2-Chloronaphthalene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2-Chlorophenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2-Methylnaphthalene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2-Methylphenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
2-Nitroaniline	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
2-Nitrophenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
3,3'-Dichlorobenzidine	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
3- and 4-Methylphenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
3-Nitroaniline	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
4,6-Dinitro-2-methylphenol	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
4-Bromophenyl-phenylether	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
4-Chloro-3-methylphenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
4-Chloroaniline	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
4-Chlorophenyl-phenylether	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
4-Nitroaniline	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
4-Nitrophenol	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
Acenaphthene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Acenaphthylene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Acetophenone	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Anthracene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		100	J
Atrazine	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Benzaldehyde	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		61	J
Benzo(a)anthracene	NA		NA		NA		73	J	NA		NA		NA		NA		NA		NA		360	J
Benzo(a)pyrene	NA		NA		NA		66	J	NA		NA		NA		NA		NA		NA		280	J
Benzo(b)fluoranthene	NA		NA		NA		94	J	NA		NA		NA		NA		NA		NA		400	J
Benzo(g,h,i)perylene	NA		NA		NA		41	J	NA		NA		NA		NA		NA		NA		130	J
Benzo(k)fluoranthene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		130	J
Butylbenzylphthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		900	

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS62		IS53SS63		IS53SS64		IS53SS65		IS53SS66		IS53SS66		IS53SS67		IS53SS68		IS53SS69		IS53SS70		IS53SS71	
Sample ID	IS53SS620001		IS53SS630001		IS53SS640001		IS53SS650001		IS53SS660001		IS53SS66P0001		IS53SS670001		IS53SS680001		IS53SS690001		IS53SS700001		IS53SS710001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																						
Caprolactam	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Carbazole	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		63	J
Chrysene	NA		NA		NA		84	J	NA		NA		NA		NA		NA		NA		350	J
Di-n-butylphthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		95	J
Di-n-octylphthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Dibenz(a,h)anthracene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Dibenzofuran	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Diethylphthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Dimethyl phthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Fluoranthene	NA		NA		NA		160	J	NA		NA		NA		NA		NA		NA		740	
Fluorene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Hexachlorobenzene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Hexachlorobutadiene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Hexachlorocyclopentadiene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Hexachloroethane	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Indeno(1,2,3-cd)pyrene	NA		NA		NA		41	J	NA		NA		NA		NA		NA		NA		150	J
Isophorone	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Naphthalene	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Pentachlorophenol	NA		NA		NA		950	U	NA		NA		NA		NA		NA		NA		1,000	U
Phenanthrene	NA		NA		NA		94	J	NA		NA		NA		NA		NA		NA		550	
Phenol	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Pyrene	NA		NA		NA		140	J	NA		NA		NA		NA		NA		NA		670	
bis(2-Chloroethoxy)methane	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
bis(2-Chloroethyl)ether	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
bis(2-Ethylhexyl)phthalate	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		600	
n-Nitroso-di-n-propylamine	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
n-Nitrosodiphenylamine	NA		NA		NA		380	U	NA		NA		NA		NA		NA		NA		400	U
Explosives (µg/kg)																						
1,3,5-Trinitrobenzene	570	UJ	530	UJ	580	UJ	570	UJ	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	590	UJ
1,3-Dinitrobenzene	570	UJ	530	UJ	580	UJ	570	UJ	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	590	UJ
2,4,6-Trinitrotoluene	570	UJ	530	UJ	580	UJ	570	UJ	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	590	UJ
2,4-Dinitrotoluene	570	UJ	530	UJ	580	UJ	380	U	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	400	U
2,6-Dinitrotoluene	570	U	530	U	580	U	380	U	570	U	550	U	610	U	570	U	570	U	650	U	400	U
2-Amino-4,6-dinitrotoluene	570	UJ	530	UJ	580	UJ	570	UJ	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	590	UJ
2-Nitrotoluene	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
3-Nitrotoluene	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
4-Amino-2,6-dinitrotoluene	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
4-Nitrotoluene	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
HMX	570	UJ	530	UJ	580	UJ	570	UJ	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	590	UJ
Nitrobenzene	570	UJ	530	UJ	580	UJ	380	U	570	UJ	550	UJ	610	UJ	570	UJ	570	UJ	650	UJ	400	U
Nitrocellulose	2,900	U	2,700	U	3,000	U	2,800	U	2,900	U	2,900	U	3,500		2,900	U	39,000		3,300	U	3,000	U
Nitroglycerin	57,000	U	53,000	U	58,000	U	57,000	U	57,000	U	55,000	U	61,000	U	57,000	U	57,000	U	65,000	U	59,000	U
Nitroguanidine	110,000	U	110,000	U	120,000	U	110,000	U	110,000	U	110,000	U	120,000	U	110,000	U	110,000	U	130,000	U	120,000	U

NA-Not analyzed
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D-Diluted sample
J-Estimated
K-Reported value may be biased high

L-Biased low
R-Rejected
U-Not Detected
UJ-Not Detected, estimated
UL-not detected, biased low

Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS62		IS53SS63		IS53SS64		IS53SS65		IS53SS66		IS53SS66		IS53SS67		IS53SS68		IS53SS69		IS53SS70		IS53SS71	
Sample ID	IS53SS620001		IS53SS630001		IS53SS640001		IS53SS650001		IS53SS660001		IS53SS66P0001		IS53SS670001		IS53SS680001		IS53SS690001		IS53SS700001		IS53SS710001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																						
PETN	57,000	U	53,000	U	58,000	U	57,000	U	57,000	U	55,000	U	61,000	U	57,000	U	57,000	U	65,000	U	59,000	U
RDX	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
Tetryl	570	U	530	U	580	U	570	U	570	U	550	U	610	U	570	U	570	U	650	U	590	U
Total Metals (mg/kg)																						
Aluminum	4,830		716		7,060		3,870		7,550		7,200		3,220		5,820		4,020		2,710		4,430	
Antimony	0.71	U	0.66	U	0.74	U	0.69	U	0.7	U	0.7	U	0.74	U	0.7	U	0.7	U	0.78	U	0.74	U
Arsenic	11.4		3.4		6.1		3.6		15.1		14.7		4.6		3.4		4.3		11		6.8	
Barium	33.4	J	5.8	J	50		47.7		42.3	J	39.1	J	21.6	J	28.8	J	29.8	J	38.1	J	43.1	J
Beryllium	0.32	B	0.12	B	0.47	B	0.38	B	0.38	B	0.39	B	0.31	B	0.28	B	0.28	B	0.4	B	0.37	B
Cadmium	0.28	J	0.47	J	0.1	U	0.09	U	0.16	J	0.1	J	0.1	U	0.09	U	0.16	J	0.14	J	0.78	J
Calcium	1,620		632	J	1,840		868	J	911	J	761	J	481	J	426	J	2,010		2,230		2,190	
Chromium	10.7		3.5		14.3		10.1		13		13.6		9.2		9.4		9.1		8.1		14.4	
Cobalt	3.8	J	0.92	J	6	J	4.4	J	3.2	J	2.8	J	1.3	J	2.9	J	1.7	J	4.4	J	9.9	J
Copper	23.5	J	8.7	J	18.8	J	7.6	J	11.6	J	14.1	J	10.9	J	5.4	J	9.5	J	14.4	J	36.8	J
Cyanide	0.58	U	0.54	U	0.59	U	0.57	U	0.57	U	0.57	U	0.63	U	0.57	U	0.58	U	0.65	U	0.6	U
Iron	9,920		4,260		13,000		7,160		14,900		15,700		5,520		9,530		8,660		6,630		10,400	
Lead	58.7		31		132		32.6		27.9		26.3		51.1		14.2		56.9		30.9		255	
Magnesium	963	J	116	J	2,440		436	J	601	J	534	J	243	J	480	J	299	J	1,100	J	541	J
Manganese	132		59.7		70.9		382		74.9		59		26.7		78.7		124		90.6		99.7	
Mercury	1.9	K	4	K	358	K	0.46	K	0.25	K	0.13	K	35.6	K	9.3	K	9.9	K	1.2	K	12.9	K
Nickel	12.8		4.2	J	26.4		6	J	7.5	J	6.8	J	5	J	3	J	1.9	J	19.1		5.8	J
Potassium	350	J	105	J	817	J	200	J	627	J	551	J	156	J	334	J	218	J	163	J	338	J
Selenium	0.73	U	0.68	U	0.76	U	0.71	U	0.93	J	0.72	U	0.77	U	0.72	U	0.72	U	0.81	U	0.76	U
Silver	0.3	J	0.59	J	0.41	J	0.29	U	0.39	J	0.29	U	0.34	J	0.29	U	0.33	J	0.56	J	0.48	J
Sodium	79.1	J	56.9	U	133	J	59.4	U	60.4	U	60.4	U	64	U	60.3	U	60.5	U	67.6	U	63.4	U
Thallium	0.89	U	0.83	U	0.93	U	0.87	U	0.88	U	1.5	J	0.93	U	0.88	U	0.88	U	0.99	U	0.92	U
Vanadium	18.2		7.4	U	23.5		17.5		29.3		28.8		25.2		17.7		19.7		13.8		20.9	
Zinc	190		91.8		97.3		31.5		101		82		19.5		21.1		51.6		50.2		151	
Wet Chemistry (mg/kg)																						
Total organic carbon (TOC)	67,000		NA		NA		NA		NA		NA		NA		NA		NA		NA		72,000	
pH	8		NA		NA		NA		NA		NA		NA		NA		NA		NA		6.5	

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Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS72	IS53SS73	IS53SS74		IS53SS75	IS53SS76	IS53SS77	IS53SS78
Sample ID	IS53SS720001	IS53SS730001	IS53SS740001	IS53SS74P0001	IS53SS750001	IS53SS760001	IS53SS770001	IS53SS780001
Sample Date	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name								
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS72	IS53SS73	IS53SS74		IS53SS75	IS53SS76	IS53SS77	IS53SS78
Sample ID	IS53SS720001	IS53SS730001	IS53SS740001	IS53SS74P0001	IS53SS750001	IS53SS760001	IS53SS770001	IS53SS780001
Sample Date	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01	05/02/01
Chemical Name								
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS72		IS53SS73		IS53SS74		IS53SS74		IS53SS75		IS53SS76		IS53SS77		IS53SS78	
Sample ID	IS53SS720001		IS53SS730001		IS53SS740001		IS53SS74P0001		IS53SS750001		IS53SS760001		IS53SS770001		IS53SS780001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																
Caprolactam	NA		NA		NA		NA		NA		NA		NA		NA	
Carbazole	NA		NA		NA		NA		NA		NA		NA		NA	
Chrysene	NA		NA		NA		NA		NA		NA		NA		NA	
Di-n-butylphthalate	NA		NA		NA		NA		NA		NA		NA		NA	
Di-n-octylphthalate	NA		NA		NA		NA		NA		NA		NA		NA	
Dibenz(a,h)anthracene	NA		NA		NA		NA		NA		NA		NA		NA	
Dibenzofuran	NA		NA		NA		NA		NA		NA		NA		NA	
Diethylphthalate	NA		NA		NA		NA		NA		NA		NA		NA	
Dimethyl phthalate	NA		NA		NA		NA		NA		NA		NA		NA	
Fluoranthene	NA		NA		NA		NA		NA		NA		NA		NA	
Fluorene	NA		NA		NA		NA		NA		NA		NA		NA	
Hexachlorobenzene	NA		NA		NA		NA		NA		NA		NA		NA	
Hexachlorobutadiene	NA		NA		NA		NA		NA		NA		NA		NA	
Hexachlorocyclopentadiene	NA		NA		NA		NA		NA		NA		NA		NA	
Hexachloroethane	NA		NA		NA		NA		NA		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	NA		NA		NA		NA		NA		NA		NA		NA	
Isophorone	NA		NA		NA		NA		NA		NA		NA		NA	
Naphthalene	NA		NA		NA		NA		NA		NA		NA		NA	
Pentachlorophenol	NA		NA		NA		NA		NA		NA		NA		NA	
Phenanthrene	NA		NA		NA		NA		NA		NA		NA		NA	
Phenol	NA		NA		NA		NA		NA		NA		NA		NA	
Pyrene	NA		NA		NA		NA		NA		NA		NA		NA	
bis(2-Chloroethoxy)methane	NA		NA		NA		NA		NA		NA		NA		NA	
bis(2-Chloroethyl)ether	NA		NA		NA		NA		NA		NA		NA		NA	
bis(2-Ethylhexyl)phthalate	NA		NA		NA		NA		NA		NA		NA		NA	
n-Nitroso-di-n-propylamine	NA		NA		NA		NA		NA		NA		NA		NA	
n-Nitrosodiphenylamine	NA		NA		NA		NA		NA		NA		NA		NA	
Explosives (µg/kg)																
1,3,5-Trinitrobenzene	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
1,3-Dinitrobenzene	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
2,4,6-Trinitrotoluene	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
2,4-Dinitrotoluene	540	UJ	560	UJ	1,200	J	590	U	540	U	560	U	590	U	610	U
2,6-Dinitrotoluene	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
2-Amino-4,6-dinitrotoluene	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
2-Nitrotoluene	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
3-Nitrotoluene	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
4-Amino-2,6-dinitrotoluene	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
4-Nitrotoluene	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
HMX	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
Nitrobenzene	540	UJ	560	UJ	590	U	590	U	540	U	560	U	590	U	610	U
Nitrocellulose	2,800	U	2,800	U	51,000		72,000		5,600		16,000		3,000	U	13,000	
Nitroglycerin	54,000	U	56,000	U	59,000	U	59,000	U	54,000	U	56,000	U	59,000	U	61,000	U
Nitroguanidine	110,000	U	110,000	U	120,000	U	120,000	U	110,000	U	110,000	U	120,000	U	120,000	U

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D-Diluted sample
J-Estimated
K-Reported value may be biased high

L-Biased low
R-Rejected
U-Not Detected
UJ-Not Detected, estimated
UL-not detected, biased low

Table E-1
Surface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SS72		IS53SS73		IS53SS74		IS53SS74		IS53SS75		IS53SS76		IS53SS77		IS53SS78	
Sample ID	IS53SS720001		IS53SS730001		IS53SS740001		IS53SS74P0001		IS53SS750001		IS53SS760001		IS53SS770001		IS53SS780001	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name																
PETN	54,000	U	56,000	U	59,000	U	59,000	U	54,000	U	56,000	U	59,000	U	61,000	U
RDX	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
Tetryl	540	U	560	U	590	U	590	U	540	U	560	U	590	U	610	U
Total Metals (mg/kg)																
Aluminum	6,080		5,680		6,970		5,610		5,120		7,660		4,730		3,520	
Antimony	1.4	J	0.7	U	1.5	L	1.4	L	2.4	L	0.87	L	0.72	UL	0.76	UL
Arsenic	5.3		12.7		7.1		6.4		32.1		39.7		1.7	J	10	
Barium	56		55.6		77.7		102		71		46.1		22.2	J	12.9	J
Beryllium	0.42	B	0.42	B	0.5	J	0.55	J	0.33	J	0.35	J	0.14	J	0.25	J
Cadmium	0.35	J	1.2		1.2		2.1		1.5		0.33	J	0.09	U	0.1	U
Calcium	1,050	J	1,520		580	J	614	J	2,550		893	J	100	J	217	J
Chromium	14.1		17.8		26.1		21.1		25.9		17.9		8.6		8.3	
Cobalt	4	J	3.9	J	8.6	J	9.7	J	18.9		5.4	J	2.2	J	1.6	J
Copper	22.8	J	18.9	J	881		964		56.9		679		3.4	J	12.5	
Cyanide	0.55	U	0.56	U	0.59	U	0.59	U	0.55	U	0.57	U	0.6	U	0.62	U
Iron	12,700		12,100		12,700		11,000		11,700		13,600		7,490		8,090	
Lead	108		184		727		670		400		322		8.3		337	
Magnesium	569	J	670	J	1,100	J	805	J	598	J	597	J	348	J	376	J
Manganese	218		244		543		713		153		148		104		29.3	
Mercury	0.4	K	1.2	K	251		274		157		55.4		0.13		0.51	
Nickel	4.2	J	8.8	J	12.3		11.4		8.5	J	7.6	J	2	J	4.4	J
Potassium	352	J	377	J	369	J	308	J	287	J	436	J	180	J	337	J
Selenium	0.7	U	0.72	U	0.75	UL	0.75	UL	0.87	L	0.87	L	0.74	UL	0.78	UL
Silver	0.52	J	0.6	J	2	J	1.9	J	4.3		1	J	0.3	U	0.51	J
Sodium	58.4	U	60.2	U	62.8	U	62.9	U	57.7	U	66.8	J	62.2	U	65.3	U
Thallium	0.85	U	0.88	U	0.92	U	0.92	U	0.87	J	1.9	J	0.91	U	2	J
Vanadium	23.6		25.4		27.4		21.3		21.4		26.1		14.5		39.8	
Zinc	84.4		267		358		392		347		509		17.1		107	
Wet Chemistry (mg/kg)																
Total organic carbon (TOC)	NA		NA		NA		NA		NA		NA		NA		140,000	
pH	NA		NA		NA		NA		NA		NA		NA		5	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SB01		IS49SB02		IS49SB02		IS49SB03		IS49SB05		IS49SB06		IS53SB01		IS53SB01		IS53SB02	
Sample ID	IS49SB010405		IS49SB020708		IS49SB02P0708		IS49SB030607		IS49SB050507		IS49SB060507		IS53SB010608		IS53SB01P0608		IS53SB020204	
Sample Date	05/15/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01	
Chemical Name																		
Volatile Organic Compounds (µg/kg)																		
1,1,1-Trichloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,1,2,2-Tetrachloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	13	B	14	B	14	B	13	B	12	B	NA		NA		NA	
1,1,2-Trichloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,1-Dichloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,1-Dichloroethene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2,4-Trichlorobenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2-Dibromo-3-chloropropane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2-Dibromoethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2-Dichlorobenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2-Dichloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,2-Dichloropropane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,3-Dichlorobenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
1,4-Dichlorobenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
2-Butanone	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
2-Hexanone	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
4-Methyl-2-pentanone	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Acetone	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Benzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Bromodichloromethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Bromoform	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Bromomethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Carbon disulfide	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Carbon tetrachloride	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Chlorobenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Chloroethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Chloroform	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Chloromethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Cumene	7.9	J	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Cyclohexane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Dibromochloromethane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Dichlorodifluoromethane(Freon-12)	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SB01		IS49SB02		IS49SB02		IS49SB03		IS49SB05		IS49SB06		IS53SB01		IS53SB01		IS53SB02	
Sample ID	IS49SB010405		IS49SB020708		IS49SB02P0708		IS49SB030607		IS49SB050507		IS49SB060507		IS53SB010608		IS53SB01P0608		IS53SB020204	
Sample Date	05/15/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01	
Chemical Name																		
Ethylbenzene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Methyl acetate	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Methylcyclohexane	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Methylene chloride	12	U	5.1	B	4.3	B	5.7	B	4.9	B	3.5	B	NA		NA		NA	
Styrene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Tetrachloroethene	54		12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Toluene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Trichloroethene	3.1	J	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Trichlorofluoromethane(Freon-11)	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Vinyl chloride	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Xylene, total	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
cis-1,2-Dichloroethene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
cis-1,3-Dichloropropene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
o-Xylene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
trans-1,2-Dichloroethene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
trans-1,3-Dichloropropene	12	U	12	U	12	U	12	U	13	U	13	U	NA		NA		NA	
Semi-volatile Organic Compounds (µg/kg)																		
1,1-Biphenyl	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,2'-Oxybis(1-chloropropane)	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,4,5-Trichlorophenol	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
2,4,6-Trichlorophenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,4-Dichlorophenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,4-Dimethylphenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,4-Dinitrophenol	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
2-Chloronaphthalene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2-Chlorophenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2-Methylnaphthalene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2-Methylphenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2-Nitroaniline	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
2-Nitrophenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
3,3'-Dichlorobenzidine	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
3- and 4-Methylphenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SB01		IS49SB02		IS49SB02		IS49SB03		IS49SB05		IS49SB06		IS53SB01		IS53SB01		IS53SB02	
Sample ID	IS49SB010405		IS49SB020708		IS49SB02P0708		IS49SB030607		IS49SB050507		IS49SB060507		IS53SB010608		IS53SB01P0608		IS53SB020204	
Sample Date	05/15/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01	
Chemical Name																		
3-Nitroaniline	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
4,6-Dinitro-2-methylphenol	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
4-Bromophenyl-phenylether	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
4-Chloro-3-methylphenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
4-Chloroaniline	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
4-Chlorophenyl-phenylether	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
4-Nitroaniline	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
4-Nitrophenol	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
Acenaphthene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Acenaphthylene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Acetophenone	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Anthracene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Atrazine	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzaldehyde	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzo(a)anthracene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzo(a)pyrene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzo(b)fluoranthene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzo(g,h,i)perylene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Benzo(k)fluoranthene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Butylbenzylphthalate	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Caprolactam	400	R	410	R	410	R	390	R	420	R	420	R	NA		NA		NA	
Carbazole	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Chrysene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Di-n-butylphthalate	400	U	56	J	46	J	390	U	420	U	420	U	NA		NA		NA	
Di-n-octylphthalate	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Dibenz(a,h)anthracene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Dibenzofuran	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Diethylphthalate	110	J	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Dimethyl phthalate	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Fluoranthene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Fluorene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Hexachlorobenzene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Hexachlorobutadiene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Hexachlorocyclopentadiene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SB01		IS49SB02		IS49SB02		IS49SB03		IS49SB05		IS49SB06		IS53SB01		IS53SB01		IS53SB02	
Sample ID	IS49SB010405		IS49SB020708		IS49SB02P0708		IS49SB030607		IS49SB050507		IS49SB060507		IS53SB010608		IS53SB01P0608		IS53SB020204	
Sample Date	05/15/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01	
Chemical Name																		
Hexachloroethane	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Indeno(1,2,3-cd)pyrene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Isophorone	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Naphthalene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Pentachlorophenol	990	U	1,000	U	1,000	U	980	U	1,000	U	1,100	U	NA		NA		NA	
Phenanthrene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Phenol	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Pyrene	40	J	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
bis(2-Chloroethoxy)methane	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
bis(2-Chloroethyl)ether	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
bis(2-Ethylhexyl)phthalate	54	J	410	U	410	U	390	U	50	J	51	J	NA		NA		NA	
n-Nitroso-di-n-propylamine	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
n-Nitrosodiphenylamine	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Explosives (µg/kg)																		
1,3,5-Trinitrobenzene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
1,3-Dinitrobenzene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
2,4,6-Trinitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
2,4-Dinitrotoluene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2,6-Dinitrotoluene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
2-Amino-4,6-dinitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
2-Nitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
3-Nitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
4-Amino-2,6-dinitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
4-Nitrotoluene	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
HMX	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
Nitrobenzene	400	U	410	U	410	U	390	U	420	U	420	U	NA		NA		NA	
Nitrocellulose	5,900		3,100	U	3,100	U	3,000	U	3,100	U	3,200	U	NA		NA		NA	
Nitroglycerin	60,000	U	60,000	U	60,000	U	59,000	U	62,000	U	62,000	U	NA		NA		NA	
Nitroguanidine	120,000	U	120,000	U	120,000	U	120,000	U	120,000	U	120,000	U	NA		NA		NA	
PETN	60,000	U	60,000	U	60,000	U	59,000	U	62,000	U	62,000	U	NA		NA		NA	
RDX	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	
Tetryl	600	U	600	U	600	U	590	U	620	U	620	U	NA		NA		NA	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS49SB01		IS49SB02		IS49SB02		IS49SB03		IS49SB05		IS49SB06		IS53SB01		IS53SB01		IS53SB02	
Sample ID	IS49SB010405		IS49SB020708		IS49SB02P0708		IS49SB030607		IS49SB050507		IS49SB060507		IS53SB010608		IS53SB01P0608		IS53SB020204	
Sample Date	05/15/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/08/01	
Chemical Name																		
Total Metals (mg/kg)																		
Aluminum	9,720		9,760		10,600		3,080		11,100		3,870		13,200	J	4,710	J	5,680	J
Antimony	0.74	U	0.75	U	0.75	U	0.72	U	0.9	J	0.77	U	1	J	0.77	U	0.78	U
Arsenic	25.1		3.5		4.1		0.58	U	3.9		0.62	U	5.3		5		3.9	
Barium	46.4	J	43.1	J	36.2	J	21.1	J	46	J	24.5	J	47.6	J	28.6	J	32.2	J
Beryllium	0.51	J	0.33	J	0.34	J	0.17	J	0.49	J	0.26	J	0.52	J	0.46	J	0.43	J
Cadmium	0.1	U	0.1	U	0.1	U	0.09	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Calcium	1,740		1,360		452	J	64.7	J	1,510		719	J	1,750		1,320		1,200	J
Chromium	14.4		14.7		16.1		5.7		15.3		4.4		17.7		13.4		12	
Cobalt	7	J	5.8	J	1.7	J	0.67	J	3.4	J	0.49	J	2.3	J	1.3	J	1.4	J
Copper	21.4		8.4		9.3		5.3	J	9.7		1.7	J	8.6		5.2	J	6.7	
Cyanide	0.6	U	0.61	U	0.61	U	0.59	U	0.63	U	0.64	U	0.63	U	0.63	U	0.63	U
Iron	17,300		12,600		17,600		3,660		16,500		3,360		21,700		20,400		18,100	
Lead	25.2		13.2		11.5		7.2		14.8		7		11.7		8.7		11.4	
Magnesium	720	J	774	J	611	J	237	J	621	J	323	J	584	J	239	J	310	J
Manganese	79.7		48		15.6		2.6	J	71.2		8.8		32.1		42.3		46.3	
Mercury	0.53		0.12	U	0.98	J	0.12	U	0.11	U	0.12	U	0.25	J	0.23	J	0.88	J
Nickel	5.9	J	2.9	J	2.2	J	0.57	J	3.9	J	0.59	J	2.6	J	0.42	U	0.87	J
Potassium	685	J	594	J	689	J	249	J	538	J	213	J	1,030	J	353	J	395	J
Selenium	1.6		0.8	J	0.78	U	0.75	U	0.79	U	0.8	U	0.81	U	0.8	U	0.81	U
Silver	0.37	J	0.39	J	0.73	J	0.3	U	0.7	J	0.32	U	0.68	J	0.69	J	0.59	J
Sodium	63.4	U	64.4	U	64.9	U	63.4	J	65.8	U	80.6	J	67.5	U	66.8	U	67.4	U
Thallium	0.92	U	0.94	U	0.95	U	0.91	U	0.96	U	0.97	U	0.98	U	0.97	U	0.98	U
Vanadium	27.7		25.2		31.1		8.2	U	26.9		8.7	U	31.6		27.1		22.2	
Zinc	62.1		63.8	J	39.9	J	8.2	J	32.6	J	13.8	J	20.5		11.1		20	

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Table E-2
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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB03	IS53SB04	IS53SB06	IS53SB07	IS53SB08	IS53SB09	IS53SB10	IS53SB11
Sample ID	IS53SB031416	IS53SB041112	IS53SB061214	IS53SB071415	IS53SB081314	IS53SB090507	IS53SB100405	IS53SB110406
Sample Date	05/08/01	05/08/01	05/07/01	05/08/01	05/08/01	05/07/01	05/07/01	05/07/01
Chemical Name								
Volatile Organic Compounds (µg/kg)								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB03	IS53SB04	IS53SB06	IS53SB07	IS53SB08	IS53SB09	IS53SB10	IS53SB11
Sample ID	IS53SB031416	IS53SB041112	IS53SB061214	IS53SB071415	IS53SB081314	IS53SB090507	IS53SB100405	IS53SB110406
Sample Date	05/08/01	05/08/01	05/07/01	05/08/01	05/08/01	05/07/01	05/07/01	05/07/01
Chemical Name								
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)								
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB03	IS53SB04	IS53SB06	IS53SB07	IS53SB08	IS53SB09	IS53SB10	IS53SB11
Sample ID	IS53SB031416	IS53SB041112	IS53SB061214	IS53SB071415	IS53SB081314	IS53SB090507	IS53SB100405	IS53SB110406
Sample Date	05/08/01	05/08/01	05/07/01	05/08/01	05/08/01	05/07/01	05/07/01	05/07/01
Chemical Name								
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB03	IS53SB04	IS53SB06	IS53SB07	IS53SB08	IS53SB09	IS53SB10	IS53SB11
Sample ID	IS53SB031416	IS53SB041112	IS53SB061214	IS53SB071415	IS53SB081314	IS53SB090507	IS53SB100405	IS53SB110406
Sample Date	05/08/01	05/08/01	05/07/01	05/08/01	05/08/01	05/07/01	05/07/01	05/07/01
Chemical Name								
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Nitrocellulose	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Nitroguanidine	NA	NA	NA	NA	NA	NA	NA	NA
PETN	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA

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Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB03		IS53SB04		IS53SB06		IS53SB07		IS53SB08		IS53SB09		IS53SB10		IS53SB11	
Sample ID	IS53SB031416		IS53SB041112		IS53SB061214		IS53SB071415		IS53SB081314		IS53SB090507		IS53SB100405		IS53SB110406	
Sample Date	05/08/01		05/08/01		05/07/01		05/08/01		05/08/01		05/07/01		05/07/01		05/07/01	
Chemical Name																
Total Metals (mg/kg)																
Aluminum	8,760	J	5,990	J	11,100	J	6,920	J	14,100	J	8,970	J	13,000	J	15,000	J
Antimony	1.1	J	0.78	U	1	J	0.74	U	0.8	J	0.74	U	0.93	J	1.6	J
Arsenic	9.2		2.2	J	6.7		6.9		8.4		7.9		13.5		11.4	
Barium	36.5	J	44.9	J	49.5	J	35.5	J	55.4		29.8	J	49.2		38.6	J
Beryllium	0.54	J	0.46	J	0.5	B	0.66	J	0.72	B	0.36	B	0.44	B	0.52	B
Cadmium	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Calcium	1,650		1,170	J	2,160		71.5	J	83.4	J	297	J	1,060	J	73.3	J
Chromium	14.5		10.2		17.4		13.9		14.6		18.5		18.5		32.6	
Cobalt	1.9	J	1.3	J	2.5	J	2.5	J	3.4	J	2.1	J	8	J	2.2	J
Copper	9.4		4.8	J	14.3		11.3		16.3		10.1		61.1		12	
Cyanide	0.62	U	0.63	U	0.63	U	0.61	U	0.61	U	0.61	U	0.61	U	0.61	U
Iron	22,100		13,000		24,400		25,100		29,000		30,400		17,400		49,500	
Lead	12.4		11.4		18.5		9.8		16		13.1		443		12.9	
Magnesium	343	J	320	J	759	J	287	J	694	J	410	J	683	J	544	J
Manganese	65.5		30.5		51.1		90.6		172		43.8		110		11.5	
Mercury	0.12	U	0.13	U	4.1	J	0.12	U	0.12	U	0.17	J	32.4	J	0.12	U
Nickel	2.1	J	1.1	J	2.6	J	2.3	J	5.1	J	1.1	J	4	J	0.41	U
Potassium	678	J	283	J	709	J	448	J	1,010	J	645	J	542	J	836	J
Selenium	0.79	U	0.81	U	0.86	J	0.77	U	0.81	U	1.8		0.78	U	0.77	U
Silver	0.67	J	0.33	U	1.8	J	0.94	J	1.1	J	1.3	J	0.98	J	2	J
Sodium	189	J	67.5	U	66.2	U	64.2	U	75.2	J	64.1	U	64.9	U	64.1	U
Thallium	0.96	U	0.98	U	0.97	U	0.94	U	0.99	U	0.94	U	0.95	U	1.3	J
Vanadium	28.3		15.7		33.1		30.1		31.6		33.1		30.4		51.9	
Zinc	22.2		13.8		38.8		23.1		31.1		32.1		72		26	

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB12		IS53SB13		IS53SB14		IS53SB15		IS53SB16		IS53SB17		IS53SB18	
Sample ID	IS53SB120304		IS53SB130304		IS53SB140304		IS53SB150304		IS53SB160304		IS53SB170102		IS53SB180607	
Sample Date	05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/07/01		05/08/01	
Chemical Name														
Volatile Organic Compounds (µg/kg)														
1,1,1-Trichloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,1,2,2-Tetrachloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		12	B	13	B	11	B	13	B	9.8	B	NA	
1,1,2-Trichloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,1-Dichloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,1-Dichloroethene	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2,4-Trichlorobenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2-Dibromo-3-chloropropane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2-Dibromoethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2-Dichlorobenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2-Dichloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,2-Dichloropropane	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,3-Dichlorobenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
1,4-Dichlorobenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
2-Butanone	NA		11	U	12	U	12	U	12	U	12	U	NA	
2-Hexanone	NA		11	U	12	U	12	U	12	U	12	U	NA	
4-Methyl-2-pentanone	NA		11	U	12	U	12	U	12	U	12	U	NA	
Acetone	NA		11	U	12	U	12	U	12	U	12	U	NA	
Benzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Bromodichloromethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Bromoform	NA		11	U	12	U	12	U	12	U	12	U	NA	
Bromomethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Carbon disulfide	NA		11	U	12	U	12	U	12	U	12	U	NA	
Carbon tetrachloride	NA		11	U	12	U	12	U	12	U	12	U	NA	
Chlorobenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Chloroethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Chloroform	NA		11	U	12	U	12	U	12	U	12	U	NA	
Chloromethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Cumene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Cyclohexane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Dibromochloromethane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Dichlorodifluoromethane(Freon-12)	NA		11	U	12	U	12	U	12	U	12	U	NA	

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Naval District Washington, Indian Head
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Station ID	IS53SB12		IS53SB13		IS53SB14		IS53SB15		IS53SB16		IS53SB17		IS53SB18	
Sample ID	IS53SB120304		IS53SB130304		IS53SB140304		IS53SB150304		IS53SB160304		IS53SB170102		IS53SB180607	
Sample Date	05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/07/01		05/08/01	
Chemical Name														
Ethylbenzene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Methyl acetate	NA		11	U	12	U	12	U	12	U	12	U	NA	
Methyl-tert-butyl ether (MTBE)	NA		11	U	12	U	12	U	12	U	12	U	NA	
Methylcyclohexane	NA		11	U	12	U	12	U	12	U	12	U	NA	
Methylene chloride	NA		5.3	B	4.9	B	4	B	4.8	B	6.6	B	NA	
Styrene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Tetrachloroethene	NA		9.9	J	12	U	12	U	12	U	12	U	NA	
Toluene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Trichloroethene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Trichlorofluoromethane(Freon-11)	NA		11	U	12	U	12	U	12	U	12	U	NA	
Vinyl chloride	NA		11	U	12	U	12	U	12	U	12	U	NA	
Xylene, total	NA		11	U	12	U	12	U	12	U	12	U	NA	
cis-1,2-Dichloroethene	NA		11	U	12	U	12	U	12	U	12	U	NA	
cis-1,3-Dichloropropene	NA		11	U	12	U	12	U	12	U	12	U	NA	
o-Xylene	NA		11	U	12	U	12	U	12	U	12	U	NA	
trans-1,2-Dichloroethene	NA		11	U	12	U	12	U	12	U	12	U	NA	
trans-1,3-Dichloropropene	NA		11	U	12	U	12	U	12	U	12	U	NA	
Semi-volatile Organic Compounds (µg/kg)														
1,1-Biphenyl	NA		380	U	400	U	390	U	400	U	390	U	NA	
2,2'-Oxybis(1-chloropropane)	NA		380	U	400	U	390	U	400	U	390	U	NA	
2,4,5-Trichlorophenol	NA		950	U	990	U	980	U	990	U	980	U	NA	
2,4,6-Trichlorophenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
2,4-Dichlorophenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
2,4-Dimethylphenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
2,4-Dinitrophenol	NA		950	U	990	U	980	U	990	U	980	U	NA	
2-Chloronaphthalene	NA		380	U	400	U	390	U	400	U	390	U	NA	
2-Chlorophenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
2-Methylnaphthalene	NA		380	U	400	U	390	U	400	U	390	U	NA	
2-Methylphenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
2-Nitroaniline	NA		950	U	990	U	980	U	990	U	980	U	NA	
2-Nitrophenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
3,3'-Dichlorobenzidine	NA		380	U	400	U	390	U	400	U	390	U	NA	
3- and 4-Methylphenol	NA		380	U	400	U	390	U	400	U	390	U	NA	

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Naval District Washington, Indian Head
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Station ID	IS53SB12		IS53SB13		IS53SB14		IS53SB15		IS53SB16		IS53SB17		IS53SB18	
Sample ID	IS53SB120304		IS53SB130304		IS53SB140304		IS53SB150304		IS53SB160304		IS53SB170102		IS53SB180607	
Sample Date	05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/07/01		05/08/01	
Chemical Name														
3-Nitroaniline	NA		950	U	990	U	980	U	990	U	980	U	NA	
4,6-Dinitro-2-methylphenol	NA		950	U	990	U	980	U	990	U	980	U	NA	
4-Bromophenyl-phenylether	NA		380	U	400	U	390	U	400	U	390	U	NA	
4-Chloro-3-methylphenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
4-Chloroaniline	NA		380	U	400	U	390	U	400	U	390	U	NA	
4-Chlorophenyl-phenylether	NA		380	U	400	U	390	U	400	U	390	U	NA	
4-Nitroaniline	NA		950	U	990	U	980	U	990	U	980	U	NA	
4-Nitrophenol	NA		950	U	990	U	980	U	990	U	980	U	NA	
Acenaphthene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Acenaphthylene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Acetophenone	NA		380	U	400	U	390	U	400	U	390	U	NA	
Anthracene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Atrazine	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzaldehyde	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzo(a)anthracene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzo(a)pyrene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzo(b)fluoranthene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzo(g,h,i)perylene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Benzo(k)fluoranthene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Butylbenzylphthalate	NA		52	J	400	U	390	U	400	U	59	J	NA	
Caprolactam	NA		380	R	400	R	390	R	400	R	390	R	NA	
Carbazole	NA		380	U	400	U	390	U	400	U	390	U	NA	
Chrysene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Di-n-butylphthalate	NA		95	J	97	J	90	J	73	J	120	J	NA	
Di-n-octylphthalate	NA		380	U	400	U	390	U	400	U	390	U	NA	
Dibenz(a,h)anthracene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Dibenzofuran	NA		380	U	400	U	390	U	400	U	390	U	NA	
Diethylphthalate	NA		300	J	400	U	390	U	400	U	360	J	NA	
Dimethyl phthalate	NA		380	U	400	U	390	U	400	U	390	U	NA	
Fluoranthene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Fluorene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Hexachlorobenzene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Hexachlorobutadiene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Hexachlorocyclopentadiene	NA		380	U	400	U	390	U	400	U	390	U	NA	

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Naval District Washington, Indian Head
Indian Head, Maryland

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Sample ID	IS53SB120304		IS53SB130304		IS53SB140304		IS53SB150304		IS53SB160304		IS53SB170102		IS53SB180607	
Sample Date	05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/07/01		05/08/01	
Chemical Name														
Hexachloroethane	NA		380	U	400	U	390	U	400	U	390	U	NA	
Indeno(1,2,3-cd)pyrene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Isophorone	NA		380	U	400	U	390	U	400	U	390	U	NA	
Naphthalene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Pentachlorophenol	NA		950	U	990	U	980	U	990	U	980	U	NA	
Phenanthrene	NA		380	U	400	U	390	U	400	U	390	U	NA	
Phenol	NA		380	U	400	U	390	U	400	U	390	U	NA	
Pyrene	NA		380	U	400	U	390	U	400	U	390	U	NA	
bis(2-Chloroethoxy)methane	NA		380	U	400	U	390	U	400	U	390	U	NA	
bis(2-Chloroethyl)ether	NA		380	U	400	U	390	U	400	U	390	U	NA	
bis(2-Ethylhexyl)phthalate	NA		99	J	400	U	390	U	43	J	60	B	NA	
n-Nitroso-di-n-propylamine	NA		380	U	400	U	390	U	400	U	390	U	NA	
n-Nitrosodiphenylamine	NA		380	U	400	U	390	U	400	U	390	U	NA	
Explosives (µg/kg)														
1,3,5-Trinitrobenzene	NA		560	U	590	U	580	U	590	U	580	U	NA	
1,3-Dinitrobenzene	NA		560	U	590	U	580	U	590	U	580	U	NA	
2,4,6-Trinitrotoluene	NA		560	U	590	U	580	U	590	U	580	U	NA	
2,4-Dinitrotoluene	NA		380	U	400	U	390	U	400	U	580	U	NA	
2,6-Dinitrotoluene	NA		380	U	400	U	390	U	400	U	580	U	NA	
2-Amino-4,6-dinitrotoluene	NA		560	U	590	U	580	U	590	U	580	U	NA	
2-Nitrotoluene	NA		560	U	590	U	580	U	590	U	580	U	NA	
3-Nitrotoluene	NA		560	U	590	U	580	U	590	U	580	U	NA	
4-Amino-2,6-dinitrotoluene	NA		560	U	590	U	580	U	590	U	580	U	NA	
4-Nitrotoluene	NA		560	U	590	U	580	U	590	U	1,100		NA	
HMX	NA		560	U	590	U	580	U	590	U	580	U	NA	
Nitrobenzene	NA		380	U	400	U	390	U	400	U	580	U	NA	
Nitrocellulose	NA		2,900	U	3,000	U	3,000	U	3,000	U	2,900	U	NA	
Nitroglycerin	NA		56,000	U	59,000	U	58,000	U	59,000	U	58,000	U	NA	
Nitroguanidine	NA		110,000	U	120,000	U	120,000	U	120,000	U	120,000	U	NA	
PETN	NA		56,000	U	59,000	U	58,000	U	59,000	U	58,000	U	NA	
RDX	NA		560	U	590	U	580	U	590	U	580	U	NA	
Tetryl	NA		560	U	590	U	580	U	590	U	580	U	NA	

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB12		IS53SB13		IS53SB14		IS53SB15		IS53SB16		IS53SB17		IS53SB18	
Sample ID	IS53SB120304		IS53SB130304		IS53SB140304		IS53SB150304		IS53SB160304		IS53SB170102		IS53SB180607	
Sample Date	05/08/01		05/08/01		05/08/01		05/08/01		05/08/01		05/07/01		05/08/01	
Chemical Name														
Total Metals (mg/kg)														
Aluminum	6,080		3,820		6,270		9,070		6,270		15,300	J	7,240	J
Antimony	0.67	U	0.7	U	0.87	J	0.73	U	0.72	U	0.76	J	0.76	U
Arsenic	2.2		3.3		0.59	U	1.5	J	1.6	J	5.4		5.3	
Barium	20.8	J	32.7	J	14.9	J	19.7	J	28.2	J	56.5		28.9	J
Beryllium	0.31	J	0.19	J	0.15	J	0.19	J	0.29	J	0.45	B	0.45	J
Cadmium	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.09	U	0.1	U
Calcium	83.6	J	246	J	395	J	174	J	1,180		953	J	1,500	
Chromium	13.9		17.8		8.6		11.1		10.6		19.3		13.2	
Cobalt	4.5	J	1.2	J	0.49	J	0.81	J	2	J	3.7	J	2	J
Copper	5.7		27.5		2.8	J	4	J	7.1		15		11.1	
Cyanide	0.55	U	0.57	U	0.6	U	0.59	U	0.59	U	0.59	U	0.62	U
Iron	13,500		13,200		8,630		13,200		8,920		20,100		19,500	
Lead	7.8		22.5		6.5		6.9		15.6		49.3		10.2	
Magnesium	221	J	69.8	J	180	J	311	J	380	J	784	J	458	J
Manganese	134		1.5	J	3.4	J	8.4		28.8		75.2		59.7	
Mercury	1.1	J	362	J	0.1	U	0.11	U	3.1	J	21.8	J	0.32	J
Nickel	1.6	J	0.42	J	0.4	U	0.51	J	2	J	4.5	J	0.94	J
Potassium	245	J	116	J	172	J	260	J	252	J	784	J	460	J
Selenium	0.69	U	0.72	U	0.76	U	0.75	U	0.75	U	0.74	U	0.79	U
Silver	0.84	J	0.89	J	0.31	U	0.4	J	0.49	J	0.51	J	0.69	J
Sodium	57.7	U	60.4	U	63.2	U	62.6	U	62.3	U	62.1	U	142	J
Thallium	0.84	U	0.88	U	0.92	U	0.91	U	0.91	U	0.91	U	0.96	U
Vanadium	22.2		27.4		13.7		23.4		16.2		33.7		25.5	
Zinc	11.8	J	19.4	J	6	J	13.3	J	37.3	J	134		14.9	

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Naval District Washington, Indian Head
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Station ID	IS53SB19	IS53SB20		IS53SB21	IS53SB22	IS53SB23	IS53SB24
Sample ID	IS53SB191214	IS53SB200506	IS53SB20P0506	IS53SB210607	IS53SB220405	IS53SB230708	IS53SB240910
Sample Date	05/07/01	05/07/01	05/07/01	05/07/01	05/07/01	05/08/01	05/08/01
Chemical Name							
Volatile Organic Compounds (µg/kg)							
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA

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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB19	IS53SB20		IS53SB21	IS53SB22	IS53SB23	IS53SB24
Sample ID	IS53SB191214	IS53SB200506	IS53SB20P0506	IS53SB210607	IS53SB220405	IS53SB230708	IS53SB240910
Sample Date	05/07/01	05/07/01	05/07/01	05/07/01	05/07/01	05/08/01	05/08/01
Chemical Name							
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (µg/kg)							
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	NA	NA	NA	NA	NA	NA	NA

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U - Analyte not detected

Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB19	IS53SB20		IS53SB21	IS53SB22	IS53SB23	IS53SB24
Sample ID	IS53SB191214	IS53SB200506	IS53SB20P0506	IS53SB210607	IS53SB220405	IS53SB230708	IS53SB240910
Sample Date	05/07/01	05/07/01	05/07/01	05/07/01	05/07/01	05/08/01	05/08/01
Chemical Name							
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB19	IS53SB20		IS53SB21	IS53SB22	IS53SB23	IS53SB24
Sample ID	IS53SB191214	IS53SB200506	IS53SB20P0506	IS53SB210607	IS53SB220405	IS53SB230708	IS53SB240910
Sample Date	05/07/01	05/07/01	05/07/01	05/07/01	05/07/01	05/08/01	05/08/01
Chemical Name							
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA
Explosives (µg/kg)							
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA
Nitrocellulose	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA
Nitroguanidine	NA	NA	NA	NA	NA	NA	NA
PETN	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA

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Table E-2
Subsurface Soil Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SB19		IS53SB20		IS53SB20		IS53SB21		IS53SB22		IS53SB23		IS53SB24	
Sample ID	IS53SB191214		IS53SB200506		IS53SB20P0506		IS53SB210607		IS53SB220405		IS53SB230708		IS53SB240910	
Sample Date	05/07/01		05/07/01		05/07/01		05/07/01		05/07/01		05/08/01		05/08/01	
Chemical Name														
Total Metals (mg/kg)														
Aluminum	15,000	J	14,200	J	8,420	J	16,500	J	13,100	J	8,180		2,600	
Antimony	0.76	U	0.87	J	0.75	U	0.77	J	1.6	J	1.3	J	0.73	U
Arsenic	7.4		7.5		3.4		7.4		10.8		1.2	J	0.59	U
Barium	57.7		35.8	J	48.7		35.4	J	35.6	J	23.7	J	17.7	J
Beryllium	0.75	B	0.38	B	0.36	B	0.41	B	0.46	B	0.25	J	0.09	J
Cadmium	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.09	U
Calcium	212	J	140	J	1,010	J	371	J	50	J	342	J	58.5	J
Chromium	15.6		21.5		13.5		22		23.2		18.9		1.6	J
Cobalt	2.7	J	1.9	J	2.4	J	2.4	J	2.3	J	1.3	J	0.23	U
Copper	14.2		8.4		8.5		9.3		11.9		6.6		2.3	J
Cyanide	0.62	U	0.61	U	0.61	U	0.61	U	0.6	U	0.62	U	0.6	U
Iron	24,500		30,300		13,500		26,200		35,800		26,600		969	
Lead	13.2		9		52.7		8.8		11.4		8.4		5.6	
Magnesium	699	J	511	J	397	J	619	J	512	J	315	J	132	J
Manganese	58.3		12.5		102		13.2		21.8		10.7		0.56	J
Mercury	0.23	J	0.12	U	0.12	U	0.83	J	0.11	U	6.1	J	0.16	J
Nickel	5.7	J	0.45	J	2.1	J	1.7	J	1.9	J	0.42	U	0.4	U
Potassium	1,200	J	481	J	352	J	574	J	861	J	359	J	79.3	J
Selenium	0.79	U	2.3		0.78	U	0.78	U	0.77	U	0.79	U	0.75	U
Silver	1	J	1.3	J	0.45	J	1	J	1.6	J	1.6	J	0.31	U
Sodium	73	J	63.6	U	65.1	U	65.1	U	64.2	U	65.8	U	104	J
Thallium	0.96	U	2.1	J	0.95	U	0.95	U	1.1	J	2.3	J	0.92	U
Vanadium	35		42.8		23.2		43.5		41.2		27.8		8.2	U
Zinc	34.8		27.9		109		29.7		25.3		17.7	J	3.4	J

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Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10				IS53SD14			
Sample ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10		IS53SD10P		IS53SD14		IS53SD14P	
Sample Date	05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/02/01		05/02/01	
Chemical Name																						
Volatile Organic Compounds (µg/kg)																						
1,1,1-Trichloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,1,2,2-Tetrachloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	19	B	16	B	41	B	23	B	46	B	27	B	76	B	22	B	23	B	NA		NA	
1,1,2-Trichloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,1-Dichloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,1-Dichloroethene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2,4-Trichlorobenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2-Dibromo-3-chloropropane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2-Dibromoethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2-Dichlorobenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2-Dichloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,2-Dichloropropane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,3-Dichlorobenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
1,4-Dichlorobenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
2-Butanone	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
2-Hexanone	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
4-Methyl-2-pentanone	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Acetone	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Benzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Bromodichloromethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Bromoform	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Bromomethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Carbon disulfide	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Carbon tetrachloride	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Chlorobenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Chloroethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Chloroform	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Chloromethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Cumene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Cyclohexane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Dibromochloromethane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Dichlorodifluoromethane(Freon-12)	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	

NA - Not analyzed
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J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
UJ - Not detected, estimated
UL - Not detected, biased low

Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10				IS53SD14			
Sample ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10		IS53SD10P		IS53SD14		IS53SD14P	
Sample Date	05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/02/01		05/02/01	
Chemical Name																						
Ethylbenzene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Methyl acetate	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Methyl-tert-butyl ether (MTBE)	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Methylcyclohexane	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Methylene chloride	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Styrene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Tetrachloroethene	12	U	11	U	20	U	5	J	22	U	14	U	43		13	U	13	U	NA		NA	
Toluene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Trichloroethene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Trichlorofluoromethane(Freon-11)	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Vinyl chloride	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Xylene, total	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
cis-1,2-Dichloroethene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
cis-1,3-Dichloropropene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
o-Xylene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
trans-1,2-Dichloroethene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
trans-1,3-Dichloropropene	12	U	11	U	20	U	13	U	22	U	14	U	36	U	13	U	13	U	NA		NA	
Semi-volatile Organic Compounds (µg/kg)																						
1,1-Biphenyl	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2,2'-Oxybis(1-chloropropane)	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2,4,5-Trichlorophenol	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
2,4,6-Trichlorophenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2,4-Dichlorophenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2,4-Dimethylphenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2,4-Dinitrophenol	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
2-Chloronaphthalene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2-Chlorophenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2-Methylnaphthalene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2-Methylphenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
2-Nitroaniline	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
2-Nitrophenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
3,3'-Dichlorobenzidine	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
3- and 4-Methylphenol	420	U	350	U	88	J	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U

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Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10				IS53SD14			
Sample ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10		IS53SD10P		IS53SD14		IS53SD14P	
Sample Date	05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/02/01		05/02/01	
Chemical Name																						
3-Nitroaniline	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
4,6-Dinitro-2-methylphenol	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
4-Bromophenyl-phenylether	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
4-Chloro-3-methylphenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
4-Chloroaniline	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
4-Chlorophenyl-phenylether	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
4-Nitroaniline	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
4-Nitrophenol	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
Acenaphthene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Acenaphthylene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Acetophenone	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Anthracene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Atrazine	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Benzaldehyde	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Benzo(a)anthracene	420	U	350	U	69	J	430	U	720	U	460	U	460	J	420	U	510		830	U	720	U
Benzo(a)pyrene	420	U	350	UJ	670	U	430	U	720	UJ	460	U	420	J	420	U	470		830	U	720	U
Benzo(b)fluoranthene	420	U	350	UJ	69	J	430	U	720	UJ	460	U	680	J	420	U	580		830	U	720	U
Benzo(g,h,i)perylene	420	U	350	UJ	670	U	430	U	720	UJ	460	U	190	J	420	U	170	J	830	U	720	U
Benzo(k)fluoranthene	420	U	350	UJ	670	U	430	U	720	UJ	460	U	310	J	420	U	310	J	830	U	720	U
Butylbenzylphthalate	420	U	350	U	670	U	430	U	76	J	460	U	150	J	43	J	47	J	830	U	720	U
Caprolactam	420	R	350	R	670	R	430	R	720	R	460	R	1,200	R	830	R	420	R	830	R	720	R
Carbazole	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Chrysene	420	U	350	U	670	U	430	U	720	U	460	U	470	J	420	U	550		830	U	720	U
Di-n-butylphthalate	67	J	350	U	670	U	430	U	720	U	73	J	350	J	160	J	120	J	140	J	720	U
Di-n-octylphthalate	420	U	350	UJ	670	U	430	U	720	UJ	460	U	1,200	U	420	U	420	U	830	U	720	U
Dibenz(a,h)anthracene	420	U	350	UJ	670	U	430	U	720	UJ	460	U	1,200	U	420	U	420	U	830	U	720	U
Dibenzofuran	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Diethylphthalate	420	U	350	U	480	J	47	J	120	J	47	J	1,100	J	3,500		320	J	830	U	720	U
Dimethyl phthalate	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Fluoranthene	420	U	350	U	81	J	430	U	720	U	460	U	250	J	420	U	280	J	830	U	720	U
Fluorene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Hexachlorobenzene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Hexachlorobutadiene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Hexachlorocyclopentadiene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U

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J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
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UL - Not detected, biased low

Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10				IS53SD14			
Sample ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10		IS53SD10P		IS53SD14		IS53SD14P	
Sample Date	05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/02/01		05/02/01	
Chemical Name																						
Hexachloroethane	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Indeno(1,2,3-cd)pyrene	420	U	350	UJ	670	U	430	U	720	UJ	460	U	220	J	420	U	190	J	830	U	720	U
Isophorone	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Naphthalene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Pentachlorophenol	1,000	U	890	U	1,700	U	1,100	U	1,800	U	1,100	U	3,000	U	1,000	U	1,100	U	2,100	U	1,800	U
Phenanthrene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Phenol	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Pyrene	420	U	350	U	74	J	430	U	720	U	460	U	240	J	420	U	290	J	830	U	720	U
bis(2-Chloroethoxy)methane	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
bis(2-Chloroethyl)ether	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
bis(2-Ethylhexyl)phthalate	420	U	79	J	75	J	430	U	150	J	250	J	340	J	170	J	150	J	830	U	720	U
n-Nitroso-di-n-propylamine	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
n-Nitrosodiphenylamine	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	830	U	720	U
Explosives (µg/kg)																						
1,3,5-Trinitrobenzene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
1,3-Dinitrobenzene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
2,4,6-Trinitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
2,4-Dinitrotoluene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	1,200	U	1,100	U
2,6-Dinitrotoluene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	1,200	U	1,100	U
2-Amino-4,6-dinitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
2-Nitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
3-Nitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
4-Amino-2,6-dinitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
4-Nitrotoluene	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
HMX	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
Nitrobenzene	420	U	350	U	670	U	430	U	720	U	460	U	1,200	U	420	U	420	U	1,200	U	1,100	U
Nitrocellulose	3,100	U	2,700	U	5,000		3,200	U	5,400	U	3,400	U	10,000		3,100	U	3,200	U	6,300	U	5,500	U
Nitroglycerin	61,000	U	53,000	U	100,000	U	65,000	U	110,000	U	67,000	U	170,000	U	62,000	U	62,000	U	120,000	U	110,000	U
Nitroguanidine	120,000	U	110,000	U	200,000	U	130,000	U	210,000	U	130,000	U	350,000	U	120,000	U	120,000	U	240,000	U	220,000	U
PETN	61,000	U	53,000	U	100,000	U	65,000	U	110,000	U	67,000	U	170,000	U	62,000	U	62,000	U	120,000	U	110,000	U
Perchlorate	6	U	5	U	10	U	6	U	11	U	6	U	18	U	6	U	6	U	10	U	10	U
RDX	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U
Tetryl	610	U	530	U	1,000	U	650	U	1,100	U	670	U	1,700	U	620	U	620	U	1,200	U	1,100	U

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Indian Head, Maryland

Station ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10				IS53SD14			
Sample ID	IS53SD01		IS53SD02		IS53SD04		IS53SD05		IS53SD06		IS53SD07		IS53SD09		IS53SD10		IS53SD10P		IS53SD14		IS53SD14P	
Sample Date	05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/03/01		05/02/01		05/02/01	
Chemical Name																						
Total Metals (mg/kg)																						
Aluminum	1,780	J	712	J	4,620	J	3,780	J	5,730	J	3,920	J	3,020	J	755	J	3,330	J	9,420		9,660	
Antimony	1.2	U	1	U	1.9	U	1.6	J	5	J	5.8	J	3.5	U	1.6	J	1.2	U	1.6	UL	1.3	UL
Arsenic	16.9	L	1.5	L	4.3	L	7.7	L	8	L	12.7	L	3	L	4.3	L	3.2	L	17.9		20.2	
Barium	54	J	205	J	130	J	45.5	J	94.5	J	39.3	J	222	J	6.4	J	18.5	J	138		118	
Beryllium	0.19	J	0.06	J	0.16	J	0.21	J	0.33	J	0.27	J	0.33	J	0.07	J	0.17	J	0.71	J	0.64	J
Cadmium	3.9		0.27	J	0.34	J	0.1	U	4.5		0.6	J	2	J	0.1	U	0.49	J	1.1	J	0.7	J
Calcium	21,300	J	13,000	J	4,030	J	2,020	J	6,560	J	1,700	J	35,600	J	127,000	J	54,700	J	2,280	J	2,020	J
Chromium	12	L	6.7	L	26	L	109	L	49.5	L	39.8	L	16.7	L	21.4	L	14.1	L	16.4		15.1	
Cobalt	12.6		2.3	J	4.3	J	13.3		9.4	J	5.8	J	3.7	J	1.4	J	2.4	J	26.7		28	
Copper	34.4		8.6		69.3		361		366		130		277		40		66		28.2		24.6	
Cyanide	0.62	U	0.53	U	1	U	0.65	U	1.1	U	0.68	U	1.8	U	9.27		12.3		1.26	U	1.09	U
Iron	24,300		5,840		9,950		99,000		30,900		13,000		15,000		25,000		13,900		17,000		15,700	
Lead	61.9	J	28.7	J	1,510	J	125	J	296	J	290	J	228	J	45.1	J	92	J	82.8		69.7	
Magnesium	12,800		9,250		605	J	1,530		1,150	J	966	J	2,690	J	87,400		33,900		1,150	J	1,060	J
Manganese	2,430	L	43.6	L	62.4	L	1,320	L	556	L	635	L	402	L	225	L	141	L	1,070		1,040	
Mercury	1.24		0.34		1,290		547		96		120		69		0.69		0.11	U	24.5		24.1	
Nickel	18.2		21.8		5.2	J	70.8		20.8		15.7		23.4	J	8.9	J	7.7	J	17.8	J	15.9	J
Potassium	180	J	45.7	J	783	J	237	J	345	J	255	J	1,270	J	145	J	427	J	425	J	417	J
Selenium	0.54	R	0.47	R	0.87	R	0.57	R	1.8	L	0.6	R	1.6	R	0.55	R	0.55	R	1.6	UL	1.4	UL
Silver	0.34	L	0.13	UL	63.6	L	22.2	L	40.7	L	6.2	L	17.2	L	0.15	UL	0.15	UL	2.2	J	1.6	J
Sodium	434	J	84.1	J	460	J	79.7	U	565	J	148	J	670	J	191	J	198	J	303	J	251	J
Thallium	0.71	J	0.49	U	0.91	U	0.6	U	2.9	J	0.62	U	1.9	J	0.58	U	0.57	U	2	U	1.7	U
Vanadium	10.6	J	4.2	J	11.5	J	22.2		22.2		45		4.2	J	4.4	J	14.1		65.9		48.2	
Zinc	1,480		175		159		400		1,680		581		1,310		175		530		189		166	
Wet Chemistry (mg/kg)																						
Total organic carbon (TOC)	NA		NA		NA		NA		NA		NA		NA		NA		NA		95,000		97,000	
pH	NA		NA		NA		NA		NA		NA		NA		NA		NA		7		7	

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Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name										
Volatile Organic Compounds (µg/kg)										
1,1,1-Trichloroethane	NA		NA		NA		NA		NA	
1,1,2,2-Tetrachloroethane	NA		NA		NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA		NA		NA	
1,1,2-Trichloroethane	NA		NA		NA		NA		NA	
1,1-Dichloroethane	NA		NA		NA		NA		NA	
1,1-Dichloroethene	NA		NA		NA		NA		NA	
1,2,4-Trichlorobenzene	NA		NA		NA		NA		NA	
1,2-Dibromo-3-chloropropane	NA		NA		NA		NA		NA	
1,2-Dibromoethane	NA		NA		NA		NA		NA	
1,2-Dichlorobenzene	NA		NA		NA		NA		NA	
1,2-Dichloroethane	NA		NA		NA		NA		NA	
1,2-Dichloropropane	NA		NA		NA		NA		NA	
1,3-Dichlorobenzene	NA		NA		NA		NA		NA	
1,4-Dichlorobenzene	NA		NA		NA		NA		NA	
2-Butanone	NA		NA		NA		NA		NA	
2-Hexanone	NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	NA		NA		NA		NA		NA	
Acetone	NA		NA		NA		NA		NA	
Benzene	NA		NA		NA		NA		NA	
Bromodichloromethane	NA		NA		NA		NA		NA	
Bromoform	NA		NA		NA		NA		NA	
Bromomethane	NA		NA		NA		NA		NA	
Carbon disulfide	NA		NA		NA		NA		NA	
Carbon tetrachloride	NA		NA		NA		NA		NA	
Chlorobenzene	NA		NA		NA		NA		NA	
Chloroethane	NA		NA		NA		NA		NA	
Chloroform	NA		NA		NA		NA		NA	
Chloromethane	NA		NA		NA		NA		NA	
Cumene	NA		NA		NA		NA		NA	
Cyclohexane	NA		NA		NA		NA		NA	
Dibromochloromethane	NA		NA		NA		NA		NA	
Dichlorodifluoromethane(Freon-12)	NA		NA		NA		NA		NA	

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Table E-3
Sediment Raw Data
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Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name										
Ethylbenzene	NA		NA		NA		NA		NA	
Methyl acetate	NA		NA		NA		NA		NA	
Methyl-tert-butyl ether (MTBE)	NA		NA		NA		NA		NA	
Methylcyclohexane	NA		NA		NA		NA		NA	
Methylene chloride	NA		NA		NA		NA		NA	
Styrene	NA		NA		NA		NA		NA	
Tetrachloroethene	NA		NA		NA		NA		NA	
Toluene	NA		NA		NA		NA		NA	
Trichloroethene	NA		NA		NA		NA		NA	
Trichlorofluoromethane(Freon-11)	NA		NA		NA		NA		NA	
Vinyl chloride	NA		NA		NA		NA		NA	
Xylene, total	NA		NA		NA		NA		NA	
cis-1,2-Dichloroethene	NA		NA		NA		NA		NA	
cis-1,3-Dichloropropene	NA		NA		NA		NA		NA	
o-Xylene	NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	NA		NA		NA		NA		NA	
trans-1,3-Dichloropropene	NA		NA		NA		NA		NA	
Semi-volatile Organic Compounds (µg/kg)										
1,1-Biphenyl	NA		NA		NA		560	U	NA	
2,2'-Oxybis(1-chloropropane)	NA		NA		NA		560	U	NA	
2,4,5-Trichlorophenol	NA		NA		NA		1,400	U	NA	
2,4,6-Trichlorophenol	NA		NA		NA		560	U	NA	
2,4-Dichlorophenol	NA		NA		NA		560	U	NA	
2,4-Dimethylphenol	NA		NA		NA		560	U	NA	
2,4-Dinitrophenol	NA		NA		NA		1,400	U	NA	
2-Chloronaphthalene	NA		NA		NA		560	U	NA	
2-Chlorophenol	NA		NA		NA		560	U	NA	
2-Methylnaphthalene	NA		NA		NA		560	U	NA	
2-Methylphenol	NA		NA		NA		560	U	NA	
2-Nitroaniline	NA		NA		NA		1,400	U	NA	
2-Nitrophenol	NA		NA		NA		560	U	NA	
3,3'-Dichlorobenzidine	NA		NA		NA		560	U	NA	
3- and 4-Methylphenol	NA		NA		NA		560	U	NA	

NA - Not analyzed
B - Also detected in associated blank
J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
UJ - Not detected, estimated
UL - Not detected, biased low

Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name										
3-Nitroaniline	NA		NA		NA		1,400	U	NA	
4,6-Dinitro-2-methylphenol	NA		NA		NA		1,400	U	NA	
4-Bromophenyl-phenylether	NA		NA		NA		560	U	NA	
4-Chloro-3-methylphenol	NA		NA		NA		560	U	NA	
4-Chloroaniline	NA		NA		NA		560	U	NA	
4-Chlorophenyl-phenylether	NA		NA		NA		560	U	NA	
4-Nitroaniline	NA		NA		NA		1,400	U	NA	
4-Nitrophenol	NA		NA		NA		1,400	U	NA	
Acenaphthene	NA		NA		NA		560	U	NA	
Acenaphthylene	NA		NA		NA		560	U	NA	
Acetophenone	NA		NA		NA		560	U	NA	
Anthracene	NA		NA		NA		560	U	NA	
Atrazine	NA		NA		NA		560	U	NA	
Benzaldehyde	NA		NA		NA		560	U	NA	
Benzo(a)anthracene	NA		NA		NA		560	U	NA	
Benzo(a)pyrene	NA		NA		NA		560	U	NA	
Benzo(b)fluoranthene	NA		NA		NA		560	U	NA	
Benzo(g,h,i)perylene	NA		NA		NA		560	U	NA	
Benzo(k)fluoranthene	NA		NA		NA		560	U	NA	
Butylbenzylphthalate	NA		NA		NA		560	U	NA	
Caprolactam	NA		NA		NA		560	R	NA	
Carbazole	NA		NA		NA		560	U	NA	
Chrysene	NA		NA		NA		560	U	NA	
Di-n-butylphthalate	NA		NA		NA		280	J	NA	
Di-n-octylphthalate	NA		NA		NA		560	U	NA	
Dibenz(a,h)anthracene	NA		NA		NA		560	U	NA	
Dibenzofuran	NA		NA		NA		560	U	NA	
Diethylphthalate	NA		NA		NA		77	J	NA	
Dimethyl phthalate	NA		NA		NA		560	U	NA	
Fluoranthene	NA		NA		NA		64	J	NA	
Fluorene	NA		NA		NA		560	U	NA	
Hexachlorobenzene	NA		NA		NA		560	U	NA	
Hexachlorobutadiene	NA		NA		NA		560	U	NA	
Hexachlorocyclopentadiene	NA		NA		NA		560	U	NA	

NA - Not analyzed
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J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
UJ - Not detected, estimated
UL - Not detected, biased low

Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name										
Hexachloroethane	NA		NA		NA		560	U	NA	
Indeno(1,2,3-cd)pyrene	NA		NA		NA		560	U	NA	
Isophorone	NA		NA		NA		560	U	NA	
Naphthalene	NA		NA		NA		560	U	NA	
Pentachlorophenol	NA		NA		NA		1,400	U	NA	
Phenanthrene	NA		NA		NA		560	U	NA	
Phenol	NA		NA		NA		560	U	NA	
Pyrene	NA		NA		NA		64	J	NA	
bis(2-Chloroethoxy)methane	NA		NA		NA		560	U	NA	
bis(2-Chloroethyl)ether	NA		NA		NA		560	U	NA	
bis(2-Ethylhexyl)phthalate	NA		NA		NA		60	J	NA	
n-Nitroso-di-n-propylamine	NA		NA		NA		560	U	NA	
n-Nitrosodiphenylamine	NA		NA		NA		560	U	NA	
Explosives (µg/kg)										
1,3,5-Trinitrobenzene	700	U	660	U	810	U	840	U	650	U
1,3-Dinitrobenzene	700	U	660	U	810	U	840	U	650	U
2,4,6-Trinitrotoluene	700	U	660	U	810	U	840	U	650	U
2,4-Dinitrotoluene	700	U	660	U	810	U	840	U	650	U
2,6-Dinitrotoluene	700	U	660	U	810	U	840	U	650	U
2-Amino-4,6-dinitrotoluene	700	U	660	U	810	U	840	U	650	U
2-Nitrotoluene	700	U	660	U	810	U	840	U	650	U
3-Nitrotoluene	700	U	660	U	810	U	840	U	650	U
4-Amino-2,6-dinitrotoluene	700	U	660	U	810	U	840	U	650	U
4-Nitrotoluene	700	U	660	U	810	U	840	U	650	U
HMX	700	U	660	U	810	U	840	U	650	U
Nitrobenzene	700	U	660	U	810	U	840	U	650	U
Nitrocellulose	3,600	U	3,300	U	4,700		75,000		3,300	U
Nitroglycerin	70,000	U	66,000	U	81,000	U	84,000	U	65,000	U
Nitroguanidine	140,000	U	130,000	U	110,000	U	170,000	U	130,000	U
PETN	70,000	U	66,000	U	81,000	U	84,000	U	65,000	U
Perchlorate	10	U	10	U	10	U	10	U	10	U
RDX	700	U	660	U	810	U	840	U	650	U
Tetryl	700	U	660	U	810	U	840	U	650	U

NA - Not analyzed
B - Also detected in associated blank
J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
UJ - Not detected, estimated
UL - Not detected, biased low

Table E-3
Sediment Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample ID	IS53SD15		IS53SD16		IS53SD17		IS53SD18		IS53SD19	
Sample Date	05/02/01		05/02/01		05/02/01		05/02/01		05/02/01	
Chemical Name										
Total Metals (mg/kg)										
Aluminum	4,730		8,250		9,850		7,370		10,300	
Antimony	0.88	UL	0.79	UL	0.99	UL	1	UL	0.81	UL
Arsenic	3.9		11.4		5.9		8.3		32	
Barium	53	J	53.2		28.6	J	50.4	J	55.8	
Beryllium	0.36	J	0.51	J	0.25	J	0.44	J	0.45	J
Cadmium	0.25	J	0.38	J	0.13	U	0.36	J	0.1	U
Calcium	1,770		453	J	181	J	2,640		948	J
Chromium	10.1		13.9		13.1		14.9		12.6	
Cobalt	10.9	J	13.6		2.5	J	5.7	J	14.4	
Copper	12		12.4		8.6		27.8		14.8	
Cyanide	0.72	U	0.66	U	0.81	U	0.85	U	0.66	U
Iron	9,090		10,100		15,700		12,800		10,100	
Lead	32.3		64		23.6		120		38.9	
Magnesium	810	J	638	J	404	J	1,030	J	797	J
Manganese	488		229		23.6		195		151	
Mercury	18.6		19		3.3		962		4.4	
Nickel	6.3	J	7.1	J	4.5	J	7.5	J	26.7	
Potassium	294	J	329	J	405	J	445	J	491	J
Selenium	0.91	UL	1.1	L	1.2	L	1.1	UL	0.83	UL
Silver	0.44	J	0.35	J	0.69	J	0.7	J	0.46	J
Sodium	76	U	68.5	U	85.4	U	90.2	U	69.6	U
Thallium	1.1	U	1	J	2.5	J	1.3	U	1.6	J
Vanadium	24.4		36.6		30.9		30.7		30.1	
Zinc	83		76.7		31.3		83.3		64.6	
Wet Chemistry (mg/kg)										
Total organic carbon (TOC)	53,000		78,000		76,000		76,000		100,000	
pH	7.1		7.1		6.3		5.8		6	

NA - Not analyzed
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J - Estmated
L - Biased low
R - Unreliable result

U - Not detected above associated detection limit
UJ - Not detected, estimated
UL - Not detected, biased low

Table E-4
Surface Water Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SW01			
Sample ID	IS53SW01		IS53SW01P	
Sample Date	05/03/01		05/03/01	
Chemical Name				
Semi-volatile Organic Compounds (µg/l)				
1,1-Biphenyl	10	U	10	U
2,2'-Oxybis(1-chloropropane)	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U
2,4-Dichlorophenol	10	U	10	U
2,4-Dimethylphenol	10	U	10	U
2,4-Dinitrophenol	25	U	25	U
2-Chloronaphthalene	10	U	10	U
2-Chlorophenol	10	U	10	U
2-Methylnaphthalene	10	U	10	U
2-Methylphenol	10	U	10	U
2-Nitroaniline	25	U	25	U
2-Nitrophenol	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U
3- and 4-Methylphenol	10	U	10	U
3-Nitroaniline	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U
4-Chloroaniline	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U
4-Nitroaniline	25	U	25	U
4-Nitrophenol	25	U	25	U
Acenaphthene	10	U	10	U
Acenaphthylene	10	U	10	U
Acetophenone	10	U	10	U
Anthracene	10	U	10	U
Atrazine	10	U	10	U
Benzaldehyde	10	U	10	U
Benzo(a)anthracene	10	U	10	U
Benzo(a)pyrene	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U
Butylbenzylphthalate	10	U	10	U
Caprolactam	10	R	10	R
Carbazole	10	U	10	U
Chrysene	10	U	10	U
Di-n-butylphthalate	10	U	10	U
Di-n-octylphthalate	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U
Dibenzofuran	10	U	10	U

NA - Not analyzed
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

Table E-4
Surface Water Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SW01			
Sample ID	IS53SW01		IS53SW01P	
Sample Date	05/03/01		05/03/01	
Chemical Name				
Diethylphthalate	10	U	10	U
Dimethyl phthalate	10	U	10	U
Fluoranthene	10	U	10	U
Fluorene	10	U	10	U
Hexachlorobenzene	10	U	10	U
Hexachlorobutadiene	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U
Hexachloroethane	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U
Isophorone	10	U	10	U
Naphthalene	10	U	10	U
Pentachlorophenol	25	U	25	U
Phenanthrene	10	U	10	U
Phenol	10	U	10	U
Pyrene	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U
Explosives (µg/l)				
1,3,5-Trinitrobenzene	0.4	U	0.4	U
1,3-Dinitrobenzene	0.4	U	0.4	U
2,4,6-Trinitrotoluene	0.4	U	0.4	U
2,4-Dinitrotoluene	0.4	U	0.4	U
2,6-Dinitrotoluene	0.4	U	0.4	U
2-Amino-4,6-dinitrotoluene	0.4	U	0.4	U
2-Nitrotoluene	0.4	U	0.4	U
3-Nitrotoluene	0.4	U	0.4	U
4-Amino-2,6-dinitrotoluene	0.4	U	0.4	U
4-Nitrotoluene	0.4	U	0.4	U
HMX	0.4	U	0.4	U
Nitrobenzene	0.4	U	0.4	U
Nitrocellulose	100	U	100	U
Nitroglycerin	40	U	40	U
Nitroguanidine	80	U	80	U
PETN	40	U	40	U
Perchlorate	5	U	5	U
RDX	0.4	U	0.4	U
Tetryl	0.4	U	0.4	U

NA - Not analyzed
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

Table E-4
Surface Water Raw Data
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Station ID	IS53SW01			
Sample ID	IS53SW01		IS53SW01P	
Sample Date	05/03/01		05/03/01	
Chemical Name				
Total Metals (µg/l)				
Aluminum	514	J	344	J
Antimony	3.1	U	3.1	U
Arsenic	47		44.7	
Barium	10.1	J	9.1	J
Beryllium	0.1	U	0.11	J
Cadmium	0.82	J	0.52	J
Calcium	2,680	J	2,590	J
Chromium	0.8	U	0.8	U
Cobalt	3.1	J	2.4	J
Copper	3.1	J	3.4	J
Cyanide	10		10	
Iron	2,760		2,440	
Lead	2.5	U	5.2	
Magnesium	846	J	806	J
Manganese	1,300		1,190	
Mercury	0.81	L	1	L
Nickel	1.7	U	1.7	U
Potassium	2,590	J	2,510	J
Selenium	4.9	J	3.2	U
Silver	1.3	U	1.3	U
Sodium	95,100	J	91,400	J
Thallium	3.9	U	3.9	U
Vanadium	34.9	U	34.9	U
Zinc	28.2		26.9	
Wet Chemistry (mg/l)				
Hardness	10		11	

NA - Not analyzed
J - Reported value is estimated
L - Reported value may be biased low
R - Unreliable result

Please check ...

CHEMTECH
CHAIN OF CUSTODY RECORD

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS: 13921 Park Center Rd Suite 600

CITY: Herndon STATE: VA ZIP: 20171

ATTENTION: Shannon Stokes

PHONE: 703-471-1441 FAX: 703-471-1508

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.: 145185.FI.SS

PROJECT MANAGER: Anne Estabrook

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY
☐ RESULTS + QC
☐ NJ REDUCED
☐ NJ CLP
☐ EDD FORMAT: _____
☐ USEPA CLP
☐ NYS ASP "B"
☐ NYS ASP "A"
☐ EDD

ANALYSIS

1 ~~TCL VOC~~ 2 TCL VOC 3 List D 4 List E 5 List B 6 Explosives (nitrus nitrocellulose) 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	TCE3SS01000I	SOIL	X	X	5-1-01	1000		3	3			3					Do QA/QC
2.	TCE3SS02000I	SS		X	5-1-01	1005				1		1					
3.	TCE3SS03000I	SS		X	5-1-01	1010				1		1					
4.	TCE3SS04000I	SS		X	5-1-01	1015				1		1					
5.	TCE3SS05000I	SS		X	5-1-01	1020	1	1			1	1					
6.	TCE3SS06000I	SS		X	5-1-01	1025				1		1					
7.	TCE3SS07000I	SS		X	5-1-01	1030				1		1					
8.	TCE3SS08000I	SS		X	5-1-01	1035				1		1					

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/2/01 2000	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 1 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40268

CHEMTECH

CHAIN OF CUSTODY RECORD

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Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Cham Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: India Head Liberra

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

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EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

TCL VOC
TCL Explosives
TCL SVOC
TCL Pest/PCB
TCL Metals

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SS09 0001	Soil	X		5/1	1040			1	1							
2.	IS53SS10 0001					1045		1	1		1						
3.	IS53SS10 0001					1045		1	1		1						
4.	IS53SS11 0001					1050			1	1							
5.	IS53SS12 0001					1055			1	1							
6.	IS53SS13 0001					1100			1	1							
7.	IS53SS14 0001					1105		1	1			1					
8.	IS53SS15 0001					1110			1	1							

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.		1.
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 2 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

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40280

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205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Cathartill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Linda Hecht-Ledoux

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
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EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY
☐ RESULTS + QC
☐ NJ REDUCED
☐ NJ CLP
☐ EDD FORMAT: _____
☐ USEPA CLP
☐ NYS ASP "B"
☐ NYS ASP "A"
☐ EDD

ANALYSIS

1 TCL VOC
2 List D
3 List E
4 List B
5
6
7
8
9

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS-SS-110001	SO	X	X	5-1-01	1115		1	1			1					
2.	IS-SS-170001	SS		X	5-1-01	1120				1		1					
3.	IS-SS-180001	SS		X	5-1-01	1125				1		1					
4.	IS-SS-190001	SS		X	5-1-01	1130				1		1					
5.	IS-SS-200001	SS		X	5-1-01	1135		1			1	1					
6.	IS-SS-200D0001	SS		X	5-1-01	1135		1			1	1					
7.	IS-SS-210001	SS		X	5-1-01	1200				1		1					
8.	IS-SS-220001	SS		X	5-1-01	1200				1		1					

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/1/01 1200	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 3 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40269

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Chamtill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: India Healthcare

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 [illegible] 3 [illegible] 4 [illegible] 5 List E 6 List D 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SS230001	SOIL	X	X	5-1-01	1200			1	1							
2.	IS53SS240001	SS			5-1-01	1210		1	1			1					
3.	IS53SS250001	SS			5-1-01	1210			1	1		1					
4.	IS53SS260001	SS			5-1-01	1210			1	1							
5.	IS53SS26P0001	SS			5-1-01	1210			1	1							
6.	IS53SS270001	SS			5-1-01	1220		1	1	1	1	1					
7.	IS53SS280001	SS			5-1-01	1220		1	1		1						
8.	IS53SS290001	SS			5-1-01	1220			1	1							

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	5/6/01 2100	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 4 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40270

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

☐ 205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Tilco Headwaters

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 TCL SVOC 3 TCL Pest/PCB 4 TCL Herb 5 TCL Metals 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS (← Specify Preservatives A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other)
1.	IS52SS30001	SS	X		5-1-01	1230			1	1							
2.	IS52SS31001	SS		X	5-1-01	1230			1	1							
3.	IS52SS32001	SS		X	5-1-01	1230			1	1							
4.	IS52SS33001	SS		X	5-1-01	1240			1	1							
5.	IS52SS34001	SS		X	5-1-01	1240			1	1							
6.	IS52SS35001	SS		X	5-1-01	1240		1	1	1	1						
7.	IS52SS35P001	SS		X	5-1-01	1240		1	1	1	1						
8.	IS52SS36001	SS		X	5-1-01	1250		3	3			3					MS/MSD

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/2/01 2000	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 5 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40271

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC
2 Explosives (minus nitrosa
3 List E
4 List D
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SS37 0001	SOIL	X		5/1/01	1250			1	1							
2.	" SS38 "					1250			1	1							
3.	" SS39 "					1300		1	1		1						
4.	" SS40 "					1300			1	1							
5.	" SS41 "					1300			1	1							
6.	" SS41P "					1300			1	1							
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/2/01 2000	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 6 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40283

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Chain Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: India Headquarters

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 3 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	~~ISS3SS420001~~	~~Air~~		~~X~~	~~5/24~~	~~1400~~	~~2~~										
2.	ISS3SS420001	Soil			5/24	900			1		1						
3.	ISS3SS430001	SS			5/24	900			1		1						
4.	ISS3SS440001	SS			5/2	900		1		1	1						
5.	ISS3SS450001	SS			5/2	910	2		1		1						
6.	ISS3SS460001	SS			5/2	910			1		1						
7.	ISS3SS470001	SS			5/2	910			1		1						
8.	ISS3SS480001	SS			5/2	920			1		1						

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/24/2000	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 7 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40273

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Chlorn Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Irving Head Laboratory

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC Extended List + TB + EB

2 TCL SVOC Extended List + TB + EB

3

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PRESERVATIVES / COMMENTS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SS49001	SO	X		5/2	920		1	1	1							
2.	IS53SS50001	SS		X	5/2	920			1		1						
3.	IS53SS51001	SS			5/2	930			1		1						
4.	IS53SS52001	SS			5/2	930			3		3						MS/MSD
5.	IS53SS53001	SS			5/2	930			1		1						
6.	IS53SS54001	SS			5/2	940			1		1						
7.	IS53SS55001	SS			5/2	940			1		1						
8.	IS53SS56001	SS			5/2	940		1	1			1					

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/2/2000	1. Fedex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 8 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40274

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: India Headquarters

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC
2 Extended List
3 List E
4 List F
5 List F
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	ISS3SS57 0001	SS	X		5-2	950			1	1							
2.	ISS3SS58 0001	SS			5-2	950			1	1							
3.	ISS3SS59 0001	SS			5-2	950			1	1							
4.	ISS3SS60 0001	SS			5-2	1000			1	1							
5.	ISS3SS60P0001	SS			5-2	1000			1	1							
6.	ISS3SS61 0001	SS			5-2	1000		1	1		1						
7.	ISS3SS62 0001	SS			5-2	1000			1			1					
8.	ISS3SS63 0001	SS			5-2	1030			1	1							

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	5/2/01 2000	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 9 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40275

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Jackson Hardwood

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

TCL VOC (EPA 624)

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SS104001	SS	X		5-2	1030			1	1							
2.	IS52SS65001	SS		X	5-2	1030		1	1	1	1						
3.	IS53SS66001	SS		X	5-2	1040			1	1							
4.	IS53SS66P001	SS		X	5-2	1040			1	1							
5.	IS53SS67001	SS		X	5-2	1040			1	1							
6.	IS53SS68001	SS		X	5-2	1040			1	1							
7.	IS53SS69001	SS		X	5-2	1050			1	1							
8.	IS53SS70001	SS		X	5-2	1050			1	1							

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	5/21/2000	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 10 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40276

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: Ctlam + Ill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indg Healthcare

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 Pesticides 3 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS (← Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other)
1.	IS53SS71C001	SS	X	X	5-2	1100		1	1		1						
2.	IS53SS72C001	SS		X	5-2	1100			3	3							Do QA/QC
3.	IS53SS73C001	SS		X	5-2	1100			1	1							
4.	IS53SS74C001	SS		X	5-2	1100			1	1							
5.	IS53SS74D001	SS		X	5-2	1100			1	1							
6.	IS53SS75C001	SS		X	5-2	1110			1	1							
7.	IS53SS76C001	SS		X	5-2	1110			1	1							
8.	IS53SS77C001	SS		X	5-2	1110			1	1							

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	5/2/01 2000	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 11 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40277

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head Lake

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 Semivol-extractable 3 Lead 4 F List 5 B List 6 G List 7 H 8 Grainsize 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS (← Specify Preservatives A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other)
1.	IS53SS78C001	SD	X	X	5/2	1115		1	1	1	1						
2.	IS49SS01C001	SS			5/2	1115		1	1	1	1						
3.	IS49SS02C001	SS			5/2	1115		1	1		1						
4.	IS53SD14	SD			5/2	1400			3			3		1			MS/MSD
5.	IS53SD14P	SD			5/2	1400			1			1					
6.	IS53SD15	SD			5/2	1410			1	1			1				
7.	IS53SD16	SD			5/2	1410			1	1			1				
8.	IS53SD17	SD			5/2	1410			1	1			1				

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	5/2/01 2000	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 12 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40278

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M Hill

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 Explosives (intrinsic) 3 List G 4 List H 5 Organic Lead 6 ~~[illegible]~~ 7 ~~[illegible]~~ 8 ~~[illegible]~~ 9 ~~[illegible]~~

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SD18	SD	X	↓	5/2	1400			1	1		1					
2.	IS53SD19	SD	X	↓	5/2	1420		1	1		1						
3.	~~IS53EB0[illegible]01~~	~~NC~~		~~X~~	~~5/2~~	~~[illegible]~~		~~1~~	~~1~~	~~1~~	~~1~~	~~1~~	~~1~~	~~1~~	~~1~~	~~1~~	~~[illegible]~~
4.									3			3					
5.									1			1					
6.									1				1				
7.									1				1				
8.									1				1				

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [illegible]	5/2/01 2000	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 13 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40279

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

☐ 205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head - LAB AREA

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC
2 TCL SVOC
3 TAL Inorganics
4 Cyanide
5 Nitrocellulose
6 TOC
7 pH
8 Explosives (mini nitrocellulose)
9 Ammonium Perchlorate
10 Hardness

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	10	COMMENTS
							PRESERVATIVES	HCl	–	HNO_3	NaOH	–	H_2SO_4	–	–	–	HNO_3	
1.	IS53EB050101	Aq		X	5/1/01	1400		2	1	1	1	1	1	1	1			
2.	IS53FB050101	↓		X	5/1/01	1430		2	1	1	1	1	1	1	1	1	1	
3.	IS53TB050101			X	5/1/01	1445		2										
4.	IS53EB050201	↓		X	5/2/01	1500		2	1	1	1	1	1	1	1	1		
5.																		
6.																		
7.																		
8.																		

Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/2/01 2200	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 14 of 14

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

40282

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS: 13921 Park Center Rd #600

CITY: Herndon STATE: VA ZIP: 20164

ATTENTION: Anne Estabrook

PHONE: 703-471-1441 FAX: 703-471-1508

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.: 145185

PROJECT MANAGER: Anne Estabrook

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC 2 List B 3 Explosives (minus nitrocellulose) 4 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS49SB010405	SOIL	X		5/15/01	1400		1	1	1							
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/16/01 1200	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 1 of 1

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

43382

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS: 13921 Park Center Rd Suite 60

CITY: Herndon STATE: VA ZIP: 20171-4

ATTENTION: Anne Estabrook

PHONE: 703-471-1441 FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head-Lab Area

PROJECT NO.: 145185

PROJECT MANAGER: Anne Estabrook

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 List A 2 TCL VOC 3 List B 4 Explosives (minus nitrocellulose) 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SB090507	SOIL	X		5/7/01	1000		1									
2.	" TB050701	Aq		X		1015			2								
3.	" SB200506	SOIL	X			1040		1									
4.	" SB20P0506					1040		1									
5.	" SB170102					1130			3	3	3						Do QA/QC
6.	" SB210607					1150		1									
7.	" SB100405					1215		1									
8.	" SB110406					1345		1									

← Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/9/01 1800	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 1 of 4

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

42765

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: DAYS *

HARD COPY: DAYS *

EDD: DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT:

ANALYSIS

1 List A, 2 TCL VOC, 3 TCL SVOC, 4 TAL Inorganics, 5 Cyanide, 6 Nitrocellulose, 7 Explosives (w/ MS winning limits), 8, 9

PRESERVATIVES

COMMENTS

← Specify Preservatives: A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SB220405	SOIL	X		5/7/01	1415		1									
2.	" SB191214	↓	↓		↓	1445		1									
3.	" SB061214	↓	↓		↓	1530		1									
4.	" FB050701	Aq		X	↓	1600			2	1	1	1	1	1			
5.	" SB081314	SOIL	X		5/8/01	0730		1									
6.	" SB071415	↓	↓		↓	0800		1									
7.	" SB180607	↓	↓		↓	0900		1									
8.	" SB010608	↓	↓		↓	0930		1									

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/9/01 1800	1. FedEx
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler

Comments:

Page 2 of 4

Shipment Complete: Yes No

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

43378

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1	2	3	4	5	6	7	8	9
List A	TCL VOC	List B	Explosives (minus [illegible])					

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1	2	3	4	5	6	7	8	9	COMMENTS (← Specify Preservatives A – HCl, B – HNO_3, C – H_2SO_4, D – NaOH, E – ICE, F – Other)
1.	I S53 SB01P0608	Soil	X		5/8/01	0930		1									
2.	" SB020204					1000		3									Do QA/QC
3.	" SB031416					1030		1									
4.	" SB041112					1300		1									
5.	" ~~SB270~~ SB230708					1330		1									
6.	" SB240910					1400		1									
7.	" SB130304					1415			3	3	3						Do QA/QC
8.	" SB120304					1430		1									

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/8/01 1800	1. Fed EX
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 3 of 4

Shipment Complete: Yes _____ No _____

Ver. 6/2000

WHITE – CHEMTECH COPY FOR RETURN TO CLIENT YELLOW – CHEMTECH COPY PINK – SAMPLER COPY

43379

CHEMTECH

CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

205 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

✓ANALYSIS

1 TCL VOC
2 List B
3 Explosives (NYS NMI)
4
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
1.	IS53SB160304	SOIL	X		5/8/01	1450		1	1	1							
2.	" SB150304					1500		1	1	1							
3.	" SB140304					1510		1	1	1							
4.	IS49SB020708					1530		1	1	1							
5.	SB02P0708					1530		1	1	1							
6.	SB030607					1545		1	1	1							
7.	SB050507					1600		1	1	1							
8.	SB060507					1615		1	1	1							

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/9/01 1800	Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 4 of 4

Shipment Complete: Yes _____ No _____

Ver. 6/2000

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43380

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4, Englewood, NJ 07631, (201) 567-6868, Fax (201) 567-1333

☐ 205 Campus Plaza 1, Edison, NJ 08837, (732) 225-4111, Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS: 13921 Park Center Rd #600

CITY: Herndon STATE: VA ZIP: 20171

ATTENTION: Shannon Stokes

PHONE: 703-471-1441 FAX: 703-471-1508

PROJECT INFORMATION

PROJECT NAME: Indian Head - Lab Area

PROJECT NO.: 145185.FI.FS

PROJECT MANAGER: Anne Estabrook

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *

HARD COPY: _____ DAYS *

EDD: _____ DAYS *

* TO BE APPROVED BY CHEMTECH

** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP

☐ RESULTS + QC ☐ NYS ASP "B"

☐ NJ REDUCED ☐ NYS ASP "A"

☐ NJ CLP ☐ EDD

☐ EDD FORMAT: _____

ANALYSIS

1 TCL SVOC
2 TAL Inorganics
3 Cyanide
4 Ammonium Perchlorate
5 Nitrocellulose
6 Explosives (mixed nitrocellulose)
7 Hardness
8 TCL VOC
9 List C

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1 —	2 HNO_3	3 NaOH	4 —	5 —	6 —	7 HNO_3	8 —	9 —	COMMENTS
1.	IS53 SW01	Ag		X	5/3/01	1300		1	1	1	1	1	1	1			
2.	IS53 SW01P	Ag		X		1300		1	1	1	1	1	1	1			
3.	IS53 SD10	Soil	X			0900							1		1	1	
4.	IS53 SD10P					0900							1		1	1	
5.	IS53 SD09					0915							1		1	1	
6.	IS53 SD06					1000							1		1	1	
7.	IS53 SD05					1030							1		1	1	
8.	IS53 SD07					1100							1		1	1	

← Specify Preservatives
A – HCl B – HNO_3
C – H_2SO_4 D – NaOH
E – ICE F – Other

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/3/01 1520	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____

Comments:

Page 1 of 2

Shipment Complete: Yes _____ No _____

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42761

CHEMTECH
CHAIN OF CUSTODY RECORD

Please check one:

☐ 110 Route 4
Englewood, NJ 07631
(201) 567-6868
Fax (201) 567-1333

☐ 05 Campus Plaza 1
Edison, NJ 08837
(732) 225-4111
Fax (732) 225-4110

CHEMTECH JOB NO.:

CHEMTECH QUOTE NO.:

CLIENT INFORMATION

REPORT TO BE SENT TO:

COMPANY: CH2M HILL

ADDRESS:

CITY: STATE: ZIP:

ATTENTION:

PHONE: FAX:

PROJECT INFORMATION

PROJECT NAME: Indian Head Lab Area

PROJECT NO.:

PROJECT MANAGER:

LOCATION:

PHONE: FAX:

BILLING INFORMATION

BILL TO: PO #:

ADDRESS:

CITY: STATE: ZIP:

ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX: _____ DAYS *
HARD COPY: _____ DAYS *
EDD: _____ DAYS *
* TO BE APPROVED BY CHEMTECH
** NORMAL TURNAROUND TIME - 14 DAYS

DATA DELIVERABLE INFORMATION

☐ RESULTS ONLY ☐ USEPA CLP
☐ RESULTS + QC ☐ NYS ASP "B"
☐ NJ REDUCED ☐ NYS ASP "A"
☐ NJ CLP ☐ EDD
☐ EDD FORMAT: _____

ANALYSIS

1 TCL VOC
2 List C
3 Explosives (mins nitrocellulose)
4
5
6
7
8
9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
								–	–	–							← Specify Preservatives A – HCl B – HNO_3 C – H_2SO_4 D – NaOH E – ICE F – Other
1.	IS53SD04	SOIL	X		5/3/01	1115		1	1	1							
2.	IS53SD~~03~~02	↓	↓		↓	1145		1	1	1							
3.	IS53SD01	↓	↓		↓	1200		1	1	1							
4.	IS53TB050301	Aq		X	↓	1230		2	(contains HCl)								
5.																	
6.																	
7.																	
8.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	5/3/01 1500	1. Fed Ex
RELINQUISHED BY: 2.	DATE/TIME:	RECEIVED BY: 2.
RELINQUISHED BY: 3.	DATE/TIME:	RECEIVED FOR LAB BY: 3.

Conditions of bottles or coolers at receipt: ☐ Compliant ☐ Non-Compliant ☐ Temp. of Cooler _____
Comments:

Page 2 of 2

Shipment Complete: Yes _____ No _____

Ver. 6/2000

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42762

Appendix F
Background Data

Background Data from Indian Head Background Investigation Report, (Tetratech NUS, 2002)

TABLE 4-1

SUMMARY OF DESCRIPTIVE STATISTICS FOR ALL SURFACE AND SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [4]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	3/40	1800		13000	L	5700	430	1.4	24	RN6SS0170101	Undefined	13000	13000	NA	NA	7800000	200000000
CYCLOHEXANE	110-82-7	1/22	3.6	J	3.6	J	3.6	5.1	5.3	15	IS11SS420001	Undefined	3.6	3.6	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	1/40	2.4	J	2.4	J	2.4	4.9	1.5	15	IS11SS400001	Undefined	2.4	2.4	NA	NA	7800000	200000000
GASOLINE RANGE ORGANICS	TTNUS005	2/9	0.1225		0.17		0.15	6.4	0.12	150	IS11SS420001	Undefined	0.17	0.17	NA	NA	NA	NA
METHYL ACETATE	79-20-9	1/22	2.3	J	2.3	J	2.3	5.0	5.3	15	IS11SS390001	Undefined	2.3	2.3	NA	NA	78000000	2000000000
STYRENE	100-42-5	1/40	1.3	J	1.3	J	1.3	5.0	0.34	15	BGDSS0120101-AVG	Undefined	1.3	1.3	NA	NA	16000000	410000000
TOLUENE	108-88-3	4/40	3.3	J	140	J	61	11	0.32	15	IS11SS400001	Undefined	140	140	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	5/24	1.7	J	9.9	J	5.8	6.5	0.78	18	IS11SS420001	Undefined	9.9	9.9	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	7/40	1.7	J	2.7	J	2.2	4.9	0.33	15	BGDSB0110101	Undefined	2.7	2.7	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
1,3-DINITROBENZENE	99-65-0	1/20	32	J	32	J	32	120	37.2	393	IS11SB250203	Undefined	32	32 -	NA	NA	7800	200000
2-METHYLNAPHTHALENE	91-57-6	1/40	73	L	73	L	73	140	42	490	IS21SS200001	Undefined	73	73	NA	NA	1600000	41000000
ACENAPHTHENE	83-32-9	1/40	140		140		140	140	38.7	490	BGDSS0160101	Undefined	140	140	NA	NA	4700000	120000000
ACETOPHENONE	98-86-2	3/40	46	J	64	J	58	140	52	490	IS11SS400001	Undefined	64	64	NA	NA	7800000	200000000
ANTHRACENE	120-12-7	1/40	260		260		260	140	26.2	490	BGDSS0160101	Undefined	260	260	NA	NA	23000000	610000000
BENZALDEHYDE	100-52-7	1/34	59	J	59	J	59	150	150	490	IS25SS190001	Undefined	59	59	NA	NA	7800000	200000000
BENZO(A)ANTHRACENE	56-55-3	1/40	480		480		480	150	13.5	490	BGDSS0160101	Undefined	480	480	NA	NA	870	7800
BENZO(A)PYRENE	50-32-8	1/40	390		390		390	150	16.9	490	BGDSS0160101	Undefined	390	390	NA	NA	87	780
BENZO(B)FLUORANTHENE	205-99-2	1/40	420		420		420	150	35	490	BGDSS0160101	Undefined	420	420	NA	NA	870	7800
BENZO(G,H,I)PERYLENE	191-24-2	1/40	130		130		130	140	45	490	BGDSS0160101	Undefined	130	130	NA	NA	2300000	61000000
BENZO(K)FLUORANTHENE	207-08-9	1/40	360	J	360	J	360	150	41.8	490	BGDSS0160101	Undefined	360	360	NA	NA	8700	78000
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	14/40	51	J	7500	J	860	320	59	490	BGDSS0200101	Undefined	7500	7500	NA	NA	46000	410000
CARBAZOLE	86-74-8	1/34	130	J	130	J	130	140	35	490	BGDSS0160101	Undefined	130	130	NA	NA	32000	290000
CHRYSENE	218-01-9	1/40	440		440		440	150	21	490	BGDSS0160101	Undefined	440	440	NA	NA	87000	780000
DIBENZOFURAN	132-64-9	1/40	65	J	65	J	65	140	28.7	490	BGDSS0160101	Undefined	65	65	NA	NA	310000	82000000
FLUORANTHENE	206-44-0	2/40	65	J	1100		580	150	35	490	BGDSS0160101	Undefined	1100	1100	NA	NA	3100000	82000000
FLUORENE	86-73-7	1/40	150		150		150	140	27.1	490	BGDSS0160101	Undefined	150	150	NA	NA	3100	82000
INDENO(1,2,3-CD)PYRENE	193-39-5	1/40	100		100		100	140	46.4	490	BGDSS0160101	Undefined	100	100	NA	NA	870	7800
NAPHTHALENE	91-20-3	1/40	110	L	110	L	110	140	34.5	490	IS21SS200001	Undefined	110	110	NA	NA	1600000	41000000
PHENANTHRENE	85-01-8	1/40	1100		1100		1100	160	35	490	BGDSS0160101	Undefined	1100	1100	NA	NA	2300000	61000000
PYRENE	129-00-0	2/40	120	J	880		500	160	35	490	BGDSS0160101	Undefined	880	880	NA	NA	2300000	61000000
Explosives (ug/kg)																		
2-NITROTOLUENE	88-72-2	1/15	150	J	150	J	150	100	81.4	250	IS11SS400001	Undefined	150	150	NA	NA	780000	20000000
4-NITROTOLUENE	99-99-0	1/15	210	J	210	J	210	110	87.2	250	IS11SS400001	Undefined	210	210	NA	NA	780000	20000000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	11/40	0.23	J	10	J	1.7	1.4	1.4	4.2	BGDSS0080101	Undefined	10	10	NA	NA	1900	17000
4,4'-DDT	50-29-3	7/39	0.36	J	9.4	J	2.3	2.0	1.8	5.7	BGDSS0080101	Undefined	9.4	9.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	58/58	2010		25300		9750	9750	NA	NA	BGDSB0030101	Lognormal	11500	27400	7000 - > 100000	NA	78000	2000000
ANTIMONY	7440-36-0	3/61	0.68	J	1.8	J	1.4	0.51	0.174	2.15	BGDSB0030101	Undefined	1.8	1.8	<1 - 6.8	NA	31	820
ARSENIC	7440-38-2	64/62	0.78		18.3		5.1	4.6	0.76	4.5	BGDSS0190101	Undefined	18.3	18.3	<0.1 - 73	1.1 - 7.1	0.43	3.8
BARIUM	7440-39-3	62/62	9.07		101		41.4	41.4	NA	NA	BGDSB0030101	Undefined	101	101	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	48/62	0.05	J	1.1	L	0.45	0.36	0.047	0.53	BGDSB0030101	Undefined	1.1	1.1	<1 -7	ND - 3	160	4100
CADMIUM	7440-43-9	20/62	0.095		2.5		0.31	0.16	0.08	0.59	IS25SS190001	Lognormal	0.18	0.55	NA	<0.01 - 5.8	78	2000
CALCIUM	7440-70-2	37/58	50.7		2420		415	287	49.6	275	IS13SS100001	Undefined	2420	2420	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	62/62	3.5	K	46.5	J	17.3	17.3	NA	NA	BGDSB0150101	Undefined	46.5	46.5	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	62/62	0.58		133		6.8	6.8	NA	NA	BGDSB0030101	Undefined	133	133	<0.3 - 70	ND -20	1600	41000
COPPER	7440-50-8	58/62	1.6		25.9		8.1	7.7	1.53	4.6	BGDSB0150101	Undefined	25.9	25.9	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	7/16	0.59		0.73		0.64	0.53	0.073	2.5	IS21SS190001	Undefined	0.73	0.73	NA	NA	1600	41000
IRON	7439-89-6	58/58	2770		61600	J	18000	18000	NA	NA	BGDSB0150101	Lognormal	21700	57200	100 - > 100000	NA	47000	1200000
LEAD	7439-92-1	57/62	3.1		149		15.4	14.7	5.3	28.8	BGDSS0080101	Undefined	149	149	<10 - 300	10 - 50	400	750
MAGNESIUM	7439-95-4	58/58	143	K	1990		704	704	NA	NA	BGDSB0030101	Lognormal	809	1820	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	58/58	15.9	J	1270	J	187	187	NA	NA	BGDSB0030101	Lognormal	286	952	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	40/62	0.01		0.15	L	0.059	0.047	0.02	0.077	IS11SB250203	Lognormal	0.06	0.15	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	62/62	1.005		18.2	L	5.8	5.8	NA	NA	BGDSB0030101	Undefined	18.2	18.2	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	58/58	128		2845	J	617	617	NA	NA	BGDSB0060101-AVG	Undefined	2845	2845	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	27/62	0.168	L	2.7	L	0.94	0.84	0.153	1.9	BGDSB0190101	Lognormal	0.62	2.4	<0.1 - 3.9	<0.1 - 0.5	390	10000
SILVER	7440-22-4	18/62	0.27	L	2.25	J	0.75	0.33	0.06	0.92	BGDSB0160101-AVG	Undefined	2.2	2.2	NA	NA	390	10000
SODIUM	7440-23-5	31/58	36.5		232		79.8	69.9	18.4	447	BGDSB0060101-AVG	Undefined	232	232	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	17/62	0.48		6.05	L	1.9	0.79	0.22	3	BGDSB0160101-AVG	Undefined	6.0	6.0	NA	NA	5.5	140
VANADIUM	7440-62-2	62/62	9.78	L	127		29.3	29.3	NA	NA	BGDSB0150101	Undefined	127	127	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	62/62	6.2		70.4		21.1	21.1	NA	NA	BGDSB0030101	Undefined	70.4	70.4	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	4/4	7.8		49.9		22.3	22.3	NA	NA	S26-MW03-001	Lognormal	49.9	49.9	NA	NA	NA	NA
DIESEL RANGE ORGANICS	TTNUS004	4/9	4.3		47		18.4	9.2	3.5	4.1	IS11SS400001	Undefined	47.0	47.0	NA	NA	NA	NA
NITRITE/NITRATE	TTNUS029	1/4	1.9		1.9		1.9	1.2	1.5	2.8	S25-MW03-001	Lognormal	1.9	1.9	NA	NA	NA	NA
PH (S.U.)	TTNUS002	7/7	4.6		7		5.3	5.3	NA	NA	IS13SS100001	Lognormal	6.0	7.0	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	50/51	281		40100		7640	7490	87.5	87.5	IS11SS420001	Undefined	40100	40100	NA	NA	NA	NA
TOTAL ORGANIC HALIDES	TTNUS043	1/20	55.2		55.2		55.2	24.7	35.9	67.1	BGDSB0040101	Undefined	55.2	55.2	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	TTNUS001	2/2	33.7	L	39.1	L	36.4	36.4	NA	NA	S26-MW03-002	Undefined	39.1	39.1	NA	NA	NA	NA
TOTAL SOLIDS (%)	TTNUS045	7/7	68		79.2		75.4	75.4	NA	NA	IS25SS180001	Undefined	79.2	79.2	NA	NA	NA	NA

TABLE 4-1

SUMMARY OF DESCRIPTIVE STATISTICS FOR ALL SURFACE AND SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, September 2001.
Bolded values represent exceedences of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Lim	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	2/23	2200		13000	L	7600	680	1.9	23	RN6SS0170101	UNDEFINED	13000	13000	NA	NA	7800000	200000000
CYCLOHEXANE	110-82-7	1/14	3.6	J	3.6	J	3.6	5.3	5.4	15	IS11SS420001	UNDEFINED	3.6	3.6	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	1/23	2.4	J	2.4	J	2.4	5.0	1.5	15	IS11SS400001	UNDEFINED	2.4	2.4	NA	NA	7800000	200000000
GASOLINE RANGE ORGANICS	TTNUS005	2/5	0.1225		0.17		0.15	15	0.19	150	IS11SS420001	UNDEFINED	0.17	0.17	NA	NA	NA	NA
METHYL ACETATE	79-20-9	1/14	2.3	J	2.3	J	2.3	5.3	5.4	15	IS11SS390001	UNDEFINED	2.3	2.3	NA	NA	78000000	2000000000
STYRENE	100-42-5	1/23	1.3	J	1.3	J	1.3	5.2	0.34	15	BGDSS0120101-AVG	UNDEFINED	1.3	1.3	NA	NA	16000000	410000000
TOLUENE	108-88-3	3/23	32.5		140	J	61	15	1.9	15	IS11SS400001	UNDEFINED	140	140	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	3/15	1.7	J	9.9	J	5.6	6.4	0.78	17	IS11SS420001	UNDEFINED	9.9	9.9	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	3/23	1.7	J	2.5	J	2.1	5.2	0.33	15	BGDSS0200101	UNDEFINED	2.5	2.5	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
2-METHYLNAPHTHALENE	91-57-6	1/23	73	L	73	L	73	140	42	490	IS21SS200001	UNDEFINED	73	73	NA	NA	1500000	41000000
ACENAPHTHENE	83-32-9	1/23	140		140		140	160	38.7	490	BGDSS0160101	UNDEFINED	140	140	NA	NA	4700000	120000000
ACETOPHENONE	98-86-2	3/23	46	J	64	J	58	140	52	490	IS11SS400001	UNDEFINED	64	64	NA	NA	7800000	200000000
ANTHRACENE	120-12-7	1/23	260		260		260	160	25.2	490	BGDSS0160101	UNDEFINED	260	260	NA	NA	23000000	610000000
BENZALDEHYDE	100-52-7	1/20	59	J	59	J	59	160	130	490	IS25SS190001	UNDEFINED	59	59	NA	NA	7800000	200000000
BENZO(A)ANTHRACENE	56-55-3	1/23	480		480		480	170	13.6	490	BGDSS0160101	UNDEFINED	480	480	NA	NA	870	7800
BENZO(A)PYRENE	50-32-8	1/23	390		390		390	170	16.9	490	BGDSS0160101	UNDEFINED	390	390	NA	NA	87	780
BENZO(B)FLUORANTHENE	205-99-2	1/23	420		420		420	170	35	490	BGDSS0160101	UNDEFINED	420	420	NA	NA	870	7800
BENZO(G,H,I)PERYLENE	191-24-2	1/23	130		130		130	160	45	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	2300000	61000000
BENZO(K)FLUORANTHENE	207-08-9	1/23	360	J	360	J	360	170	41.6	490	BGDSS0160101	UNDEFINED	360	360	NA	NA	8700	78000
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	8/23	51	J	7500	J	1100	470	58	490	BGDSS0200101	UNDEFINED	7500	7500	NA	NA	46000	410000
CARBAZOLE	86-74-8	1/20	130	J	130	J	130	160	35	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	32000	290000
CHRYSENE	218-01-9	1/23	440		440		440	170	21	490	BGDSS0160101	UNDEFINED	440	440	NA	NA	87000	780000
DIBENZOFURAN	132-64-9	1/23	65	J	65	J	65	150	28.7	490	BGDSS0160101	UNDEFINED	65	65	NA	NA	310000	8200000
FLUORANTHENE	206-44-0	2/23	65	J	1100		580	190	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	3100000	82000000
FLUORENE	86-73-7	1/23	150		150		150	160	27.1	490	BGDSS0160101	UNDEFINED	150	150	NA	NA	3100	82000
INDENO(1,2,3-CD)PYRENE	193-39-5	1/23	100		100		100	160	46.4	490	BGDSS0160101	UNDEFINED	100	100	NA	NA	870	7800
NAPHTHALENE	91-20-3	1/23	110	L	110	L	110	150	34.5	490	IS21SS200001	UNDEFINED	110	110	NA	NA	1500000	41000000
PHENANTHRENE	85-01-8	1/23	1100		1100		1100	200	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	2300000	61000000
PYRENE	129-00-0	2/23	120	J	880		500	180	35	490	BGDSS0160101	UNDEFINED	880	880	NA	NA	2300000	61000000
Explosives (ug/kg)																		
2-NITROTOLUENE	88-72-2	1/9	150	J	150	J	150	110	81.4	250	IS11SS400001	UNDEFINED	150	150	NA	NA	780000	20000000
4-NITROTOLUENE	99-99-0	1/9	210	J	210	J	210	120	87.2	250	IS11SS400001	UNDEFINED	210	210	NA	NA	780000	20000000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	8/20	0.23	J	10	J	2.2	1.6	1.4	4.1	BGDSS0080101	UNDEFINED	10	10	NA	NA	1900	17000
4,4'-DDT	50-29-3	4/19	0.38	J	9.4	J	3.1	2.2	2.225	4.6	BGDSS0080101	UNDEFINED	9.4	9.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	32/32	2010		15500	J	7540	7540	NA	NA	BGDSS0150101	LOGNORMAL	9000	19700	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	30/34	0.78		18.3		4.3	4.0	1.6	3.8	BGDSS0190101	LOGNORMAL	5.2	14.9	<0.1 - 73	1.1 - 7.1	0.43	3.8
BARIUM	7440-39-3	34/34	12.5		84.8		42.5	42.5	NA	NA	S28-MW03-001	NORMAL	47.6	80.4	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	24/34	0.05	J	1.1		0.44	0.33	0.047	0.53	BGDSS0120101-AVG	UNDEFINED	1.1	1.1	<1 -7	ND - 3	160	4100
CADMIUM	7440-43-9	12/34	0.12	J	2.5		0.4	0.2	0.06	0.57	IS25SS190001	UNDEFINED	2.5	2.5	NA	<0.01 - 5.6	78	2000
CALCIUM	7440-70-2	22/32	83.9	J	2420		504	369	98.8	275	IS13SS100001	LOGNORMAL	573	2060	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	34/34	3.5	K	28.9	L	13.6	13.6	NA	NA	IS13SS100001	LOGNORMAL	15.9	33.4	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	34/34	0.58		15		5.4	5.4	NA	NA	S26-MW03-001	LOGNORMAL	7.6	22.3	<0.3 - 70	ND -20	1600	41000
COPPER	7440-50-8	32/34	1.8		19.4		6.7	6.5	4.5	4.6	BGDSS0120101-AVG	LOGNORMAL	8.0	20.3	<1 - 700	5 - 70,	3100	82000
CYANIDE	57-12-5	4/10	0.59		0.73		0.66	0.42	0.073	1.1	IS21SS190001	UNDEFINED	0.73	0.73	NA	NA	1600	41000
IRON	7439-89-6	32/32	2770		31600	J	13000	13000	NA	NA	BGDSS0120101-AVG	LOGNORMAL	18000	38500	100 - > 100000	NA	47000	1200000
LEAD	7439-92-1	32/34	3.5	J	149		18.7	17.9	9.4	10	BGDSS0080101	LOGNORMAL	21.7	62.5	<10 - 300	10 - 50	400	750
MAGNESIUM	7439-95-4	32/32	143	K	1990		604	604	NA	NA	IS13SS100001	LOGNORMAL	722	1620	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	32/32	17.4		882	J	227	227	NA	NA	S26-MW03-001	LOGNORMAL	388	1390	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	23/34	0.03		0.13	L	0.06	0.05	0.02	0.077	BGDSS0150101	LOGNORMAL	0.080	0.18	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	34/34	1.7		14		5.4	5.4	NA	NA	IS11SS410001-AVG	LOGNORMAL	6.6	15.4	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	32/32	128		2620		497	497	NA	NA	IS13SS100001	LOGNORMAL	597	1470	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	14/34	0.168	L	1.2		0.67	0.54	0.16	1.9	IS11SS400001	NORMAL	0.62	1.2	<0.1 - 3.9	<0.1 - 0.5	390	10000
SILVER	7440-22-4	9/34	0.27	L	0.84		0.6	0.29	0.06	0.92	IS11SS400001	UNDEFINED	0.84	0.84	NA	NA	390	10000
SODIUM	7440-23-5	15/32	38.5		120		64.2	65.6	19.2	407	IS11SS400001	UNDEFINED	120	120	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	7/34	1.2		2.3	L	1.5	0.62	0.22	3	BGDSS0160101	UNDEFINED	2.3	2.3	NA	NA	5.5	140
VANADIUM	7440-62-2	34/34	9.83	L	63.7		23.3	23.3	NA	NA	BGDSS0150101	LOGNORMAL	26.7	53.3	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	34/34	6.2		42.95	J	20.2	20.2	NA	NA	BGDSS0120101-AVG	NORMAL	23.6	37.5	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	2/2	21.9		49.9		35.9	35.9	NA	NA	S26-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
DIESEL RANGE ORGANICS	TTNUS004	4/5	4.3		47		18.4	15.1	4	4	IS11SS400001	LOGNORMAL	47.0	1350	NA	NA	NA	NA
NITRITE/NITRATE	TTNUS029	1/2	1.9		1.9		1.9	1.3	1.5	1.5	S25-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
PH (S.U.)	TTNUS002	7/7	4.5		7		5.3	5.3	NA	NA	IS13SS100001	LOGNORMAL	6.0	6.8	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	29/29	1410	J	40100		10900	10900	NA	NA	IS11SS420001	LOGNORMAL	18800	57200	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	TTNUS001	1/1	33.7	L	33.7	L	33.7	33.7	NA	NA	S26-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
TOTAL SOLIDS (%)	TTNUS046	7/7	66		79.2		75.4	75.4	NA	NA	IS25SS180001	UNDEFINED	79.2	79.2	NA	NA	NA	NA

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table).
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, September 2001.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
— Upper confidence and tolerance limits cannot be calculated because of the size of the data set.
NA - Not available

TABLE 4-3

SUMMARY OF DESCRIPTIVE STATISTICS FOR CLAY-LIKE SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
TOTAL XYLENES	1330-20-7	1/4	2.4	J	2.4	J	2.4	4.7	0.82	18	IS11SB260203	NORMAL	9.4	25	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	2/7	2.5	J	2.7	J	2.6	4.4	0.35	14	BGDSB0110101	NORMAL	8.3	13	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
1,3-DINITROBENZENE	99-65-0	1/3	32	J	32	J	32	120	250	393	IS11SB260203	NORMAL	260	750	NA	NA	7800	200000
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	3/7	77	J	120	J	94	110	76.8	450	BGDSB0160101-AVG	LOGNORMAL	120	980	NA	NA	46000	410000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	1/8	0.68	J	0.68	J	0.68	1.2	1.5	4.2	BGDSB0150101	UNDEFINED	0.68	0.68	NA	NA	1900	17000
4,4'-DDT	50-29-3	1/8	0.79	J	0.79	J	0.79	2.1	3.8	5.7	BGDSB0150101	NORMAL	2.5	3.9	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	11/11	6840	J	25300		16800	16800	NA	NA	BGDSB0030101	NORMAL	20400	35400	7000 - > 100000	NA	78000	2000000
ANTIMONY	7440-36-0	3/11	0.68	J	1.8	J	1.4	0.75	0.21	2.1	BGDSB0030101	UNDEFINED	1.8	1.8	<1 - 8.8	NA	31	820
ARSENIC	7440-38-2	10/11	1.9	J	14.15		8.1	7.6	4.5	4.5	BGDSB0160101-AVG	NORMAL	8.8	18.9	<0.1 - 73	1.1 - 7.1	0.43	3.8
BARIUM	7440-39-3	11/11	34.7	J	101		55.0	55.0	NA	NA	BGDSB0030101	LOGNORMAL	68.0	134	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	9/11	0.23	J	1.1	L	0.57	0.49	0.18	0.36	BGDSB0030101	LOGNORMAL	0.98	3.3	<1 -7	ND - 3	160	4100
CADMIUM	7440-43-9	1/11	0.14	J	0.14	J	0.14	0.11	0.07	0.59	IS11SB250203	LOGNORMAL	0.14	0.61	NA	<0.01 - 5.6	78	2000
CALCIUM	7440-70-2	5/11	50.7		479	J	308	190	49.6	134	BGDSB0110101	LOGNORMAL	479	2590	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	11/11	13.4		46.5	J	27.6	27.6	NA	NA	BGDSB0150101	NORMAL	33.9	60.1	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	11/11	1.5	K	133		16.8	16.8	NA	NA	BGDSB0030101	UNDEFINED	133	133	<0.3 - 70	ND -20	1600	41000
COPPER	7440-50-8	11/11	5.2	L	25.9		12.0	12.0	NA	NA	BGDSB0150101	LOGNORMAL	17.9	48.6	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	1/3	0.68		0.68		0.68	0.84	1.2	2.5	IS11SB250203	LOGNORMAL	0.68	16.1	NA	NA	1600	41000
IRON	7439-89-6	11/11	13600	J	61600	J	38400	38400	NA	NA	BGDSB0150101	NORMAL	45400	83100	100 - > 100000	NA	47000	1200000
LEAD	7439-92-1	9/11	5.4	J	27.9		13.4	12.8	12.7	28.8	BGDSB0150101	LOGNORMAL	17.4	40.5	<10 - 300	10 - 50	400	750
MAGNESIUM	7439-95-4	11/11	498	J	1990		943	943	NA	NA	BGDSB0030101	LOGNORMAL	1220	2640	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	11/11	15.9	J	1270	J	242	242	NA	NA	BGDSB0030101	LOGNORMAL	1150	4130	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	6/11	0.03	K	0.18	L	0.09	0.06	0.04	0.063	IS11SB250203	UNDEFINED	0.18	0.18	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	11/11	1.005		18.2	L	7.6	7.6	NA	NA	BGDSB0030101	UNDEFINED	18.2	18.2	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	11/11	385		1610		756	756	NA	NA	BGDSB0030101	LOGNORMAL	1050	2610	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	4/11	1.2		2.6		2.0	1.0	0.18	1.75	BGDSB0040101	LOGNORMAL	2.6	13.3	<0.1 - 3.9	<0.1 - 9.5	390	10000
SILVER	7440-22-4	4/11	0.66	J	2.25	J	1.1	0.5	0.09	0.78	BGDSB0160101-AVG	LOGNORMAL	2.2	11.4	NA	NA	390	10000
SODIUM	7440-23-5	7/11	62.1		131	L	99.2	90.7	21.4	447	BGDSB0030101	NORMAL	123	258	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	5/11	0.65	L	6.95	L	2.9	1.6	0.3	2.2	BGDSB0160101-AVG	LOGNORMAL	5.5	21.8	NA	NA	5.5	140
VANADIUM	7440-62-2	11/11	23.9		127		50.1	50.1	NA	NA	BGDSB0150101	LOGNORMAL	72.7	194	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	11/11	18.4	J	70.4		29.5	29.5	NA	NA	BGDSB0030101	UNDEFINED	70.4	70.4	<5 - 2900	8 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	1/1	9.5		9.5		9.5	9.5	NA	NA	S26-MW03-002	UNDEFINED	9.5	9.5	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	9/9	261		8300		3420	3420	NA	NA	BGDSB0110101	LOGNORMAL	8300	86500	NA	NA	NA	NA
TOTAL ORGANIC HALIDES	TTNUS043	1/4	55.2		55.2		55.2	32.3	39.6	57.1	BGDSB0040101	LOGNORMAL	55.2	281	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	TTNUS001	1/1	39.1	L	39.1	L	39.1	39.1	NA	NA	S26-MW03-002	UNDEFINED	39.1	39.1	NA	NA	NA	NA

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, September 2001.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
NA - Not available

TABLE 4-4

SUMMARY OF DESCRIPTIVE STATISTICS FOR NON-CLAY-LIKE SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	1/10	1800		1800		1800	180	2.6	13	RPLSB0030101	UNDEFINED	1800	1800	NA	NA	7800000	200000000
TOLUENE	108-88-3	1/10	3.3	J	3.3	J	3.3	4.2	5	13	IS11SB230203	UNDEFINED	3.3	3.3	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	1/5	9	J	9	J	9.0	8.0	12	17	IS11SB240203	NORMAL	9.1	13	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	2/10	1.8	J	2	J	1.9	4.5	5	13	BGDSB0200101	UNDEFINED	2.0	2.0	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	3/10	57	J	79	J	69	110	75	390	BGDSB0190101	UNDEFINED	79	79	NA	NA	46000	410000
Pesticides/PCBs (ug/kg)																		
4,4-DDE	72-55-9	4/12	0.24	J	2.9	J	1.1	1.2	1.4	3.9	BGDSB0080101	LOGNORMAL	2.3	7.7	NA	NA	1900	17000
4,4-DDT	50-29-3	2/12	0.58	J	2.4	J	1.5	1.8	1.6	4.75	BGDSB0080101	UNDEFINED	2.4	2.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	15/16	3070	J	18900		9260	9260	NA	NA	BGDSB0010101	NORMAL	11400	21400	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	14/17	1.8		9.2		4.5	3.8	0.76	1.9	BGDSB0120101	LOGNORMAL	7.9	26.7	<0.1 - 73	1.1 - 7.1	0.43	3.8
BARIUM	7440-39-3	17/17	9.07		56.2	J	30.5	30.5	NA	NA	BGDSB0080101	NORMAL	36.6	66.5	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	15/17	0.12		0.91		0.37	0.34	0.14	0.25	BGDSB0120101	LOGNORMAL	0.51	1.5	<1 -7	ND - 3	150	4100
CADMIUM	7440-43-9	7/17	0.096		0.27	K	0.18	0.13	0.06	0.511	BGDSB0080101	LOGNORMAL	0.20	0.51	NA	<0.01 - 5.6	78	2000
CALCIUM	7440-70-2	9/15	75.4	J	785	J	270	186	61	249.5	BGDSB0140101	LOGNORMAL	353	1270	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	17/17	8.2		44.7	J	18.0	18.0	NA	NA	BGDSB0060101-AVG	LOGNORMAL	23.7	59.1	1 - 1000	15 - 100	230	6100
COBALT	7440-48-4	17/17	0.845	L	7.2		3.2	3.2	NA	NA	BGDSB0120101	LOGNORMAL	4.9	14.7	<0.3 - 70	ND -30	1600	41000
COPPER	7440-50-8	15/17	1.6		23.1		8.3	7.5	1.53	4.5	BGDSB0120101	LOGNORMAL	13.6	47.6	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	2/3	0.59		0.59		0.59	0.66	1.02	1.02	IS11SB240203	UNDEFINED	0.59	0.59	NA	NA	1600	41000
IRON	7439-89-6	15/15	4030	J	31700	J	15200	15200	NA	NA	BGDSB0140101	NORMAL	16800	35200	100 - > 100000	NA	47000	1200000
LEAD	7439-92-1	16/17	3.1		25.6		9.8	9.3	5.3	5.3	BGDSB0080101	LOGNORMAL	13.5	38.6	<10 - 300	10 - 50	400	750
MAGNESIUM	7439-95-4	15/15	215	J	1720	J	741	741	NA	NA	BGDSB0120101	LOGNORMAL	1076	2940	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	15/15	16.2	J	120		62.2	62.2	NA	NA	IS11SB230203	NORMAL	78.7	155	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	11/17	0.01		0.08	L	0.04	0.03	0.03	0.059	BGDSB0140101	LOGNORMAL	0.048	0.14	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	17/17	1.8		13.2		5.4	5.4	NA	NA	BGDSB0120101	LOGNORMAL	6.9	15.9	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	15/15	237		2845	J	770	770	NA	NA	BGDSB0060101-AVG	LOGNORMAL	1140	3440	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	9/17	0.295	L	2.7	L	0.9	0.59	0.153	1	BGDSB0190101	LOGNORMAL	1.1	3.8	<0.1 - 3.9	<0.1 - 0.5	390	10000
SILVER	7440-22-4	5/17	0.83		1.1	J	0.79	0.29	0.05	0.4	BGDSB0190101	UNDEFINED	1.1	1.1	NA	NA	390	10000
SODIUM	7440-23-5	9/15	44.5		232.5		90.9	63.9	18.4	80.5	BGDSB0060101-AVG	LOGNORMAL	128	461	<500 - 50000	NA	NA	NA
THALLIUM	7440-28-0	5/17	0.48		2.8	L	1.3	0.57	0.225	1.2	BGDSB0190101	LOGNORMAL	1.1	4.1	NA	NA	5.5	140
VANADIUM	7440-62-2	17/17	9.78	L	61.9		27.9	27.9	NA	NA	BGDSB0140101	LOGNORMAL	38.8	102	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	17/17	7.3	J	45.9	J	17.6	17.6	NA	NA	BGDSB0120101	LOGNORMAL	22.2	49.7	<5 - 2900	6 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	1/1	7.8		7.8		7.8	7.8	NA	NA	S25-MW03-002	UNDEFINED	7.8	7.8	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	12/13	354	J	8200		2880	2680	87.5	87.5	BGDSB0190101	LOGNORMAL	17900	64300	NA	NA	NA	NA

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270. 1984
(surface soil values are presented in table)
2 - Dragun, James. Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, September 2001.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
NA - Not available

Background Data from
Draft Background Investigation Report
(Brown and Root, 1997)

TABLE 3-12

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR FRESHWATER SEDIMENT SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils[1]	Maryland Soils[2]	Residential Risk-Based Concentration[3]	Industrial Risk-Based Concentration[3]
Pesticides/PCBs (ug/kg)												
4,4'-DDD	4/10	1.0	40	17.1	BGDSD0090101	Lognormal	29.8	118	NA	NA	2700	24000
4,4'-DDE	5/10	1.6	12	4.84	BGDSD0090101	Lognormal	6.85	26.1	NA	NA	1900	17000
4,4'-DDT	3/10	1.9	14	6.57	BGDSD0090101	Undefined	14	14	NA	NA	1900	17000
Inorganics (mg/kg)												
Aluminum	10/10	639	18600	4393	BGDSD0070101-D	Lognormal	13234	52362	7000 - 100000	NA	78000	1000000
Arsenic	9/10	0.25	10.6	3.3	BGDSD0070101	Lognormal	10.6	83	<0.1 - 73	1.1 - 7.1	0.43	3.8
Barium	10/10	5.8	175	42.0	BGDSD0070101, BGDSD0070101-D	Lognormal	145	577	10 - 1500	150 - 700	5500	140000
Beryllium	7/10	0.13	1.9	0.52	BGDSD0100101	Lognormal	1.0	10.9	<1 - 7	ND - 3	0.15	1.3
Cadmium	7/10	0.13	0.86	0.35	BGDSD0090101	Lognormal	0.67	1.85	NA	<0.01 - 5.6	39	1000
Calcium	6/10	110	10100	2917	BGDSD0090101	Lognormal	10100	88137	100 - 280000	NA	NA	NA
Chromium	10/10	3.3	29.7	11.6	BGDSD0070101-D	Lognormal	22.9	79.2	1 - 1000	15 - 100	390	10000
Cobalt	10/10	0.87	17.6	5.97	BGDSD0070101	Lognormal	17.6	118	<0.3 - 70	ND - 20	4700	120000
Copper	10/10	0.82	28.3	9.5	BGDSD0070101-D	Lognormal	28.3	297	<1 - 700	5 - 70	3100	82000
Iron	10/10	1780	42900	13202	BGDSD0070101	Lognormal	42900	193218	100 - >100000	NA	23000	610000
Lead	10/10	1.8	79.3	23.1	BGDSD0080101	Lognormal	79.3	476	<10 - 300	10 - 50	400[4]	1000[4]
Magnesium	10/10	96.7	3030	914	BGDSD0090101	Lognormal	3030	19043	50 - 50000	NA	NA	NA
Manganese	10/10	11.2	444	182	BGDSD0090101	Lognormal	444	2561	<2 - 7000	NA	1800	47000
Mercury	10/10	0.01	0.25	0.07	BGDSD0070101	Lognormal	0.195	0.778	0.01 - 3.4	0.04 - 0.14	23	610
Nickel	8/10	0.54	25.2	9.2	BGDSD0010101	Lognormal	25.2	382	<5 - 700	ND - 30	1600	41000
Potassium	10/10	95.2	2050	567	BGDSD0020101	Lognormal	1326	5081	50 - 37000	NA	NA	NA
Selenium	7/10	0.45	2.3	0.93	BGDSD0070101	Lognormal	1.73	6.45	<0.1 - 3.9	<0.1 - 0.5	390	10000
Silver	2/10	0.31	0.92	0.62	BGDSD0090101	Undefined	0.92	0.92	NA	NA	390	10000
Sodium	8/10	30.2	303	85.7	BGDSD0090101	Lognormal	144	472	<500 - 50000	NA	NA	NA
Vanadium	10/10	3.2	46.3	18.6	BGDSD0100101	Lognormal	46.3	196	<7 - 300	20 - 150	550	14000
Zinc	9/10	4.4	158	41.2	BGDSD0070101-D	Lognormal	158	1660	<5 - 2800	8 - 113	23000	610000
Miscellaneous (mg/kg)												
Total organic carbon	10/10	444	43500	10052	BGDSD0070101-D	Lognormal	43500	395297	NA	NA	NA	NA

Notes:
1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984. Values presented in table are surface soil values
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991. Values presented in table are surface soil values.
3 - EPA Region III Risk-Based Concentrations, October 22, 1997
4 - Values are presented in OSWER Directive #9355.4-12
Bolded values are exceedances of Region III RBCs
NA - Not available

DRAFT

Appendix G
Sample Statistics

Table G-1
Lab Area Surface Soil Statistics
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Analyte	Number of Detections	Maximum Concentration	Sample ID of Maximum Detected Value	Sample Mean Concentration	Base-Wide Background 95% UCL	Base-Wide Background Mean Concentration	Site-Specific Background Maximum Concentration	
							IS53SS77	IS53SS78
VOC (µg/kg)								
Tetrachloroethene	4 / 19	7.3	IS53SS560001	5.66	ND	ND	NA	NA
SVOC (µg/kg)								
1,1-Biphenyl	1 / 20	58	IS53SS200001	188.9	ND	ND	NA	NA
2-Methylnaphthalene	1 / 20	140	IS53SS200001	193	73	140	NA	NA
Acenaphthene	2 / 20	1,200	IS53SS200001	239.5	140	160	NA	NA
Acenaphthylene	1 / 20	53	IS53SS360001	189.4	ND	ND	NA	NA
Acetophenone	4 / 20	260	IS53SS140001	185.8	64	140	NA	NA
Anthracene	7 / 20	2,900	IS53SS200001	302.2	260	160	NA	NA
Benzaldehyde	3 / 20	420	IS53SS140001	200.05	59	160	NA	NA
Benzo(a)anthracene	16 / 20	7700	IS53SS200001	657.8	480	170	NA	NA
Benzo(a)pyrene	16 / 20	6,300	IS53SS200001	568.3	390	170	NA	NA
Benzo(b)fluoranthene	16 / 20	9,100	IS53SS200001	799.85	420	170	NA	NA
Benzo(g,h,i)perylene	14 / 20	1,700	IS53SS200001	211.3	130	160	NA	NA
Benzo(k)fluoranthene	13 / 20	2,800	IS53SS200001	349.6	360	170	NA	NA
Butylbenzylphthalate	10 / 20	23,000	IS53SS010001	1,360.6	ND	ND	NA	NA
Carbazole	5 / 20	1,600	IS53SS200001	245.4	130	160	NA	NA
Chrysene	16 / 20	7,900	IS53SS200001	703.5	440	170	NA	NA
Di-n-butylphthalate	16 / 20	9,700	IS53SS350001	674.75	ND	ND	NA	NA
Di-n-octylphthalate	1 / 20	170	IS53SS010001	195	ND	ND	NA	NA
Dibenz(a,h)anthracene	1 / 20	220	IS53SS200001	197	ND	ND	NA	NA
Dibenzofuran	2 / 20	600	IS53SS200001	209	65	150	NA	NA
Diethylphthalate	6 / 20	210	IS53SS350001	160.1	ND	ND	NA	NA
Dimethyl phthalate	3 / 20	450	IS53SS140001	199.5	ND	ND	NA	NA
Fluoranthene	17 / 20	17,000	IS53SS200001	1,363.45	1,100	190	NA	NA
Fluorene	2 / 20	1,100	IS53SS200001	237	150	160	NA	NA
Indeno(1,2,3-cd)pyrene	15 / 20	1,900	IS53SS200001	216.6	100	160	NA	NA
Naphthalene	2 / 20	350	IS53SS200001	195	110	150	NA	NA
Phenanthrene	16 / 20	13,000	IS53SS200001	948.55	1,100	200	NA	NA
Pyrene	17 / 20	14,000	IS53SS200001	1,196.45	880	180	NA	NA
bis(2-Ethylhexyl)phthalate	15 / 20	1,900	IS53SS010001	410.45	7,500	470	NA	NA
EXPLOSIVES (µg/kg)								
2,4-Dinitrotoluene	4 / 82	7,300	IS53SS010001	384.70	ND	ND	590 U	610 U
2-Amino-4,6-dinitrotoluene	1 / 82	2,135	IS53SS060001	315.85	ND	ND	590 U	610 U
HMX	1 / 82	268,364	IS53SS330001	3,562.67	ND	ND	590 U	610 U
Nitrocellulose	22 / 81	75,000	IS53SD18	4,966.67	ND	ND	3,000 U	13,000
METALS (mg/kg)								
Aluminum	82 / 82	12,000	IS53SS270001	5,512.11	9,000	7,540	4,730	3,520
Antimony	33 / 82	17.8	IS53SS280001	1.32	ND	ND	0.72 UL	0.76 UL
Arsenic	82 / 82	66.1	IS53SS260001	10.95	5.2	4.0	1.7 J	10
Barium	82 / 82	799	IS53SS570001	68.62	47.6	42.5	22.2 J	12.9 J
Beryllium	64 / 82	0.63	IS53SS320001	0.29	1.1	0.33	0.14 J	0.25 J
Cadmium	65 / 82	31.2	IS53SS260001	1.86	2.5	0.2	0.09 U	0.1 U
Calcium	82 / 82	99,000	IS49SS020001	4,586.99	573	369	100 J	217 J
Chromium	82 / 82	124	IS53SS260001	18.80	15.9	13.6	8.6	8.3
Cobalt	82 / 82	18.9	IS53SS750001	5.55	7.5	5.4	2.2 J	1.6 J
Copper	82 / 82	4,000	IS53SS460001	124.59	8.0	6.5	3.4 J	12.5
Cyanide	3 / 82	1.4	IS53SS260001	0.32	0.73	0.42	0.6 U	0.62 U
Iron	82 / 82	32,600	IS53SS260001	11,277.32	16,000	13,000	7,490	8,090
Lead	82 / 82	31,200	IS53SS260001	987.36	21.7	17.9	8.3	337
Magnesium	82 / 82	9,300	IS53SS420001	1,329.15	722	604	348 J	376 J
Manganese	82 / 82	713	IS53SS740001	185.05	388	227	104	29.3
Mercury	76 / 81	962	IS53SD18	52.40	0.06	0.05	0.13	0.51
Nickel	82 / 82	76.7	IS49SS010001	13.17	6.6	5.4	2 J	4.4 J
Potassium	82 / 82	927	IS53SS510001	374.45	597	497	180 J	337 J
Selenium	14 / 82	1.3	IS53SS110001	0.50	0.62	0.54	0.74 UL	0.78 UL
Silver	61 / 82	19.6	IS53SS340001	0.99	0.84	0.29	0.3 U	0.51 J
Sodium	36 / 82	1,470	IS53SS260001	117.80	120	65.6	62.2 U	65.3 U
Thallium	16 / 82	2.5	IS53SD17	0.63	2.3	0.62	0.91 U	2 J
Vanadium	81 / 82	38.2	IS53SS570001	23.01	26.7	23.3	14.5	39.8
Zinc	82 / 82	6,000	IS53SS260001	445.75	23.6	20.2	17.1	107
WET CHEMISTRY (mg/kg)								
Total organic carbon (TOC)	13 / 13	150,000	IS53SS100001	62,307.69	16,800	10,900	NA	140,000

Note: Dry sediment samples IS53SD16-IS53SD19 are treated as surface soil samples for screening and comparison.

All Base-Wide Background Mean Concentrations and 95% Upper Confidence Limits taken from *Indian Head Background Investigation Report Table 4-2: Summary of Descriptive Statistics for Surface Soils* (Tetratech NUS, 2002).

ND = Not detected
NA = Not analyzed
B = Analyte not detected above associated blank
D = Result came from a diluted sample
J = Reported value is estimated
K = Reported value may be biased high
L = Reported value may be biased low
R = Unreliable result
U = Not detected
UJ = Not detected, quantitation limit may be inaccurate or imprecise
UL = Not detected, quantitation limit is probably higher

Table G-2
Lab Area Sewer Bedding Subsurface Soil Statistics
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Analyte	Number of Detections	Maximum Concentration	Sample ID of Maximum Detected Value	Sample Mean Concentration	Base-Wide Background 95% UCL	Base-Wide Background Mean Concenration
VOC (µg/kg)						
Cumene	1 / 10	7.9	IS49SB010405	6.24	ND	ND
Tetrachloroethene	2 / 10	54	IS49SB010405	11.29	ND	ND
Trichloroethene	1 / 10	3.1	IS49SB010405	5.76	ND	ND
SVOC (µg/kg)						
Butylbenzylphthalate	2 / 10	59	IS53SB170102	172.6	ND	ND
Di-n-butylphthalate	6 / 10	120	IS53SB170102	134.6	ND	ND
Diethylphthalate	3 / 10	360	IS53SB170102	218.5	ND	ND
Pyrene	1 / 10	40	IS49SB010405	184	ND	ND
bis(2-Ethylhexyl)phthalate	5 / 10	99	IS53SB130304	128.7	120	110
EXPLOSIVES (µg/kg)						
4-Nitrotoluene	1 / 10	1,100	IS53SB170102	377.5	ND	ND
Nitrocellulose	1 / 10	5,900	IS49SB010405	1950	ND	ND
METALS (mg/kg)						
Aluminum	28 / 28	16,500	IS53SB210607	9,454.29	20,400	16,800
Antimony	13 / 28	1.6	IS53SB110406	0.68	1.8	0.78
Arsenic	24 / 28	25.1	IS49SB010405	5.83	9.8	7.6
Barium	28 / 28	57.7	IS53SB191214	36.46	68	55
Beryllium	18 / 28	0.66	IS53SB071415	0.23	0.96	0.49
Calcium	28 / 28	2,160	IS53SB061214	767.29	479	190
Chromium	28 / 28	32.6	IS53SB110406	15.11	33.9	27.6
Cobalt	27 / 28	8	IS53SB100405	2.53	133	16.8
Copper	28 / 28	61.1	IS53SB100405	11.71	17.9	12
Iron	28 / 28	49,500	IS53SB110406	19,662.11	45,400	36,400
Lead	28 / 28	443	IS53SB100405	30.23	17.4	12.9
Magnesium	28 / 28	784	IS53SB170102	457.17	1,220	943
Manganese	28 / 28	172	IS53SB081314	49.70	1,150	242
Mercury	16 / 28	362	IS53SB130304	15.56	0.18	0.06
Nickel	24 / 28	5.9	IS49SB010405	2.06	18.2	7.8
Potassium	28 / 28	1,200	IS53SB191214	528.33	1050	756
Selenium	5 / 28	2.3	IS53SB200506	0.58	2.6	1
Silver	23 / 28	2	IS53SB110406	0.82	2.2	0.5
Sodium	7 / 28	189	IS53SB031416	50.05	123	90.7
Thallium	4 / 28	2.3	IS53SB230708	0.65	72.7	50.1
Vanadium	25 / 28	51.9	IS53SB110406	27.09	46.8	30.9
Zinc	28 / 28	134	IS53SB170102	33.45	70.4	29.5

Note: There are no site-specific background data for subsurface soil.

All Base-Wide Background Mean Concentrations and 95% Upper Confidence Limits taken from *Indian Head Background Investigation Report Table 4-3: Summary of Descriptive Statistics for Clay-Like Subsurface Soils* (Tetratech NUS, 2002).
ND = Not detected

Table G-3
Lab Area Sewer Sediment Statistics
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Analyte	Number of Detections	Maximum Concentration	Sample ID of Maximum Detected Value	Sample Mean Concentration
VOC (µg/kg)				
Tetrachloroethene	2 / 8	43	IS53SD09	11.75
SVOC (µg/kg)				
3- and 4-Methylphenol	1 / 8	88	IS53SD04	261
Benzo(a)anthracene	3 / 8	510	IS53SD10	278.63
Benzo(a)pyrene	2 / 8	470	IS53SD10	301.88
Benzo(b)fluoranthene	3 / 8	680	IS53SD09	314.88
Benzo(g,h,i)perylene	2 / 8	190	IS53SD09	235.63
Benzo(k)fluoranthene	2 / 8	310	IS53SD09	268.13
Butylbenzylphthalate	3 / 8	150	IS53SD09	179.75
Chrysene	2 / 8	550	IS53SD10	318.13
Di-n-butylphthalate	4 / 8	350	IS53SD09	216.88
Diethylphthalate	6 / 8	3,500	IS53SD10	709.88
Fluoranthene	3 / 8	280	IS53SD10	225.13
Indeno(1,2,3-cd)pyrene	2 / 8	220	IS53SD09	241.88
Pyrene	3 / 8	290	IS53SD10	224.25
bis(2-Ethylhexyl)phthalate	6 / 8	340	IS53SD09	186.13
EXPLOSIVES (µg/kg)				
Nitrocellulose	2 / 8	10,000	IS53SD09	3187.5
METALS (mg/kg)				
Aluminum	8 / 8	5,730	IS53SD06	3,361.5
Antimony	4 / 8	5.8	IS53SD07	2.23
Arsenic	8 / 8	16.9	IS53SD01	7.3
Barium	8 / 8	222	IS53SD09	101.1
Beryllium	8 / 8	0.33	IS53SD06	0.22
Cadmium	7 / 8	4.5	IS53SD06	1.52
Calcium	8 / 8	127,000	IS53SD10	26,401.25
Chromium	8 / 8	109	IS53SD05	35.14
Cobalt	8 / 8	13.3	IS53SD05	6.73
Copper	8 / 8	366	IS53SD06	164.04
Cyanide	1 / 8	12.34	IS53SD10	1.94
Iron	8 / 8	99,000	IS53SD05	27,873.75
Lead	8 / 8	1,510	IS53SD04	328.95
Magnesium	8 / 8	87,400	IS53SD10	14,548.88
Manganese	8 / 8	2,430	IS53SD01	709.25
Mercury	8 / 8	1,290	IS53SD04	265.53
Nickel	8 / 8	70.8	IS53SD05	23.1
Potassium	8 / 8	1,270	IS53SD09	442.84
Selenium	1 / 1	1.8	IS53SD06	1.8
Silver	6 / 8	63.6	IS53SD04	18.8
Sodium	7 / 8	670	IS53SD09	324.87
Thallium	3 / 8	2.9	IS53SD06	0.89
Vanadium	8 / 8	45	IS53SD07	16.75
Zinc	8 / 8	1,680	IS53SD06	789.38

Note: There are no base-wide or site-specific background data for sewer sediment.
ND = Not detected

Table G-4
Lab Area Wetlands Surface Water
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Analyte	Number of Detections	Maximum Concentration	Sample ID of Maximum Detected Value	Sample Mean Concentration
METALS (µg/l)				
Aluminum	1 / 1	514	IS53SW01	514
Arsenic	1 / 1	47	IS53SW01	47
Barium	1 / 1	10.1	IS53SW01	10.1
Beryllium	1 / 1	0.11	IS53SW01	0.11
Cadmium	1 / 1	0.82	IS53SW01	0.82
Calcium	1 / 1	2,680	IS53SW01	2,680
Cobalt	1 / 1	3.1	IS53SW01	3.1
Copper	1 / 1	3.4	IS53SW01	3.4
Cyanide	1 / 1	10	IS53SW01	10
Iron	1 / 1	2,760	IS53SW01	2,760
Lead	1 / 1	5.2	IS53SW01	5.2
Magnesium	1 / 1	846	IS53SW01	846
Manganese	1 / 1	1,300	IS53SW01	1,300
Mercury	1 / 1	1	IS53SW01	1
Potassium	1 / 1	2,590	IS53SW01	2,590
Selenium	1 / 1	4.9	IS53SW01	4.9
Sodium	1 / 1	95,100	IS53SW01	95,100
Zinc	1 / 1	28.2	IS53SW01	28.2
WET CHEMISTRY (mg/l)				
Hardness	1 / 1	11	IS53SW01	11

Note: There are no base-wide or site-specific background data for surface water.

Table G-5
Lab Area Wetlands Sediment
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, Maryland

Analyte	Number of Detections	Maximum Concentration	Sample ID of Maximum Detected Value	Sample Mean Concentration	Base-Wide Background 95% UCL	Base-Wide Background Mean Concentration
SVOC (µg/kg)						
Di-n-butylphthalate	1 / 1	140	IS53SD14	140	ND	ND
METALS (mg/kg)						
Aluminum	2 / 2	9,660	IS53SD14	7,195	13,234	4,393
Arsenic	2 / 2	20.2	IS53SD14	12.05	10.6	3.3
Barium	2 / 2	138	IS53SD14	95.5	145	42
Beryllium	2 / 2	0.71	IS53SD14	0.535	1	0.52
Cadmium	2 / 2	1.1	IS53SD14	0.675	0.57	0.35
Calcium	2 / 2	2,280	IS53SD14	2025	10,100	2,917
Chromium	2 / 2	16.4	IS53SD14	13.25	22.9	11.6
Cobalt	2 / 2	28	IS53SD14	19.45	17.6	5.97
Copper	2 / 2	28.2	IS53SD14	20.1	28.3	9.5
Iron	2 / 2	17,000	IS53SD14	13,045	42,900	13,202
Lead	2 / 2	82.8	IS53SD14	57.55	79.3	23.1
Magnesium	2 / 2	1,150	IS53SD14	980	3,030	914
Manganese	2 / 2	1,070	IS53SD14	779	444	162
Mercury	2 / 2	24.5	IS53SD14	21.55	0.2	0.07
Nickel	2 / 2	17.8	IS53SD14	12.05	25.2	9.2
Potassium	2 / 2	425	IS53SD14	359.5	1,328	567
Silver	2 / 2	2.2	IS53SD14	1.32	0.92	0.62
Sodium	1 / 2	303	IS53SD14	170.5	144	85.7
Vanadium	2 / 2	65.9	IS53SD14	45.15	46.3	18.6
Zinc	2 / 2	189	IS53SD14	136	158	41.2
WET CHEMISTRY (mg/kg)						
Total organic carbon (TOC)	2 / 2	97,000	IS53SD14	75000	43,500	43,500

Note: Dry sediment samples IS53SD16 - IS53SD19 are included with the Lab Area Surface Soil Detects in Table 3-1
Note: There are no site-specific background data for wetland sediment.
ND = Not detected

All Base-Wide Background Mean Concentrations and 95% Upper Confidence Limits taken from Brown and Root's Draft *Indian Head Background Investigation Report Table 3-12: Summary of Descriptive Statistics for Freshwater Sediment Samples* (Brown and Root, 1997).

Appendix H
Human-Health Risk Assessment
RAGS Part D Tables for the
Lab Area Underground Sewer Line

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Lab Area Underground Sewer Lines

Lab Area Remedial Investigation

Naval District Washington, Indian Head

Indian Head, Maryland

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Other Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers may be exposed to subsurface soil during repair of the sewer lines.
						Ingestion	On-site	Quant	Industrial workers may be exposed to subsurface soil during repair of the sewer lines.
		Air	Emissions from Subsurface soil	Other Worker	Adult	Inhalation	On-site	Quant	Industrial workers may inhale dust and volatile emissions from site soils during repair of the sewer lines.
Current/Future	Sediment	Sediment	Underground Sewer Lines	Other Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers may contact sediment during repair of the sewer lines.
						Ingestion	On-site	Quant	Industrial workers may contact sediment during repair of the sewer lines.
Future	Sediment	Sediment	Underground Sewer Lines	Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers may contact sediment during repair of the sewer lines.
						Ingestion	On-site	Quant	Industrial workers may contact sediment during repair of the sewer lines.
	Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Exposure to soil during construction activities.
						Ingestion	On-site	Quant	Exposure to soil during construction activities.
				Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers working on site may contact soil.
						Ingestion	On-site	Quant	Industrial workers working on site may contact soil.
				Trespasser/Visitor	Adult	Dermal Absorption	On-site	None	Not considered a complete pathway because source area in below ground.
						Ingestion	On-site	None	Not considered a complete pathway because source area in below ground.
					Adolescents	Dermal Absorption	On-site	None	Not considered a complete pathway because source area in below ground.
						Ingestion	On-site	None	Not considered a complete pathway because source area in below ground.
				Resident	Adult	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Adult/Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
		Air	Emissions from exposed subsurface soil	Construction Worker	Adult	Inhalation	On-site	Quant	Exposure to emissions from soil during construction activities.
				Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial workers working on site may inhale dust and volatile emissions from site soils.
				Trespasser/Visitor	Adult	Inhalation	On-site	None	Not considered a complete pathway because source area in below ground.
					Adolescents	Inhalation	On-site	None	Not considered a complete pathway because source area in below ground.
				Resident	Adult	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Adult/Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.

Quant: will be quantitatively evaluated.

Table H-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-82-8	Cumene	0.0079	J	0.0079	J	MG/KG	IS49SB010405	1/10	0.011 - 0.013	0.0079	N/A	782 N	N/A	N/A	NO	BSL
127-18-4	Tetrachloroethene	0.0099	J	0.054		MG/KG	IS49SB010405	2/10	0.011 - 0.013	0.054	N/A	12.3 C	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	0.0031	J	0.0031	J	MG/KG	IS49SB010405	1/10	0.011 - 0.013	0.0031	N/A	1.6 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.052	J	0.059	J	MG/KG	IS53SB170102	2/10	0.38 - 0.42	0.059	N/A	1,564 N	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.056	J	0.12	J	MG/KG	IS53SB170102	6/10	0.38 - 0.42	0.12	N/A	782 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.11	J	0.36	J	MG/KG	IS53SB170102	3/10	0.38 - 0.42	0.36	N/A	6,257 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.04	J	0.04	J	MG/KG	IS49SB010405	1/10	0.38 - 0.42	0.04	N/A	235 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.043	J	0.099	J	MG/KG	IS53SB130304	5/10	0.38 - 0.42	0.099	N/A	45.6 C	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	1.1		1.1		MG/KG	IS53SB170102	1/10	0.56 - 0.62	1.1	N/A	78 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	5.9		5.9		MG/KG	IS49SB010405	1/10	2.9 - 3.2	5.9	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2,600		16,500	J	MG/KG	IS53SB210607	28/28	1.7 - 2	16500	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	0.76	J	1.6	J	MG/KG	IS53SB110406 IS53SB220405	13/28	0.67 - 0.78	1.6	N/A	3.13 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.2	J	25.1		MG/KG	IS49SB010405	24/28	0.54 - 0.63	25.1	N/A	0.426 C	N/A	N/A	YES	ASL
7440-39-3	Barium	14.9	J	57.7		MG/KG	IS53SB191214	28/28	0.065 - 0.076	57.7	N/A	548 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.09	J	0.66	J	MG/KG	IS53SB071415	18/28	0.022 - 0.03	0.66	N/A	15.6 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	50	J	2,160		MG/KG	IS53SB061214	28/28	0.67 - 0.78	2160	N/A	NA	N/A	N/A	NO	NUT
7440-47-3	Chromium	1.6	J	32.6		MG/KG	IS53SB110406	28/28	0.17 - 0.2	32.6	N/A	23.5 N	N/A	N/A	YES	ASL
7440-48-4	Cobalt	0.49	J	8	J	MG/KG	IS53SB100405	27/28	0.22 - 0.25	8	N/A	160 N	N/A	N/A	NO	BSL
7440-50-8	Copper	1.7	J	61.1		MG/KG	IS53SB100405	28/28	0.17 - 0.2	61.1	N/A	313 N	N/A	N/A	NO	BSL
7439-89-6	Iron	969		49,500		MG/KG	IS53SB110406	28/28	3.2 - 3.7	49500	N/A	2,346 N	N/A	N/A	YES	ASL
7439-92-1	Lead	5.6		443		MG/KG	IS53SB100405	28/28	0.54 - 0.63	443	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	69.8	J	784	J	MG/KG	IS53SB170102	28/28	1.7 - 2	784	N/A	NA	N/A	N/A	NO	NUT
7439-96-5	Manganese	0.56	J	172		MG/KG	IS53SB081314	28/28	0.043 - 0.051	172	N/A	156 N	N/A	N/A	YES	ASL
7439-97-6	Mercury	0.16	J	362	J	MG/KG	IS53SB130304	16/28	0.1 - 10	362	N/A	2.35 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	0.42	J	5.9	J	MG/KG	IS49SB010405	24/28	0.37 - 0.43	5.9	N/A	156 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	79.3	J	1,200	J	MG/KG	IS53SB191214	28/28	6.8 - 7.9	1200	N/A	NA	N/A	N/A	NO	NUT
7782-49-2	Selenium	0.8	J	2.3		MG/KG	IS53SB200506	5/28	0.69 - 0.81	2.3	N/A	39.1 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.37	J	2	J	MG/KG	IS53SB110406	23/28	0.28 - 0.33	2	N/A	39.1 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	63.4	J	189	J	MG/KG	IS53SB031416	7/28	58 - 68	189	N/A	NA	N/A	N/A	NO	NUT
7440-28-0	Thallium	1.1	J	2.3	J	MG/KG	IS53SB230708	4/28	0.84 - 0.99	2.3	N/A	0.548 N	N/A	N/A	YES	ASL
7440-62-2	Vanadium	13.7		51.9		MG/KG	IS53SB110406	25/28	7.6 - 8.9	51.9	N/A	54.8 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	3.4	J	134		MG/KG	IS53SB170102	28/28	0.11 - 0.13	134	N/A	2,346 N	N/A	N/A	NO	BSL

Table H-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for Chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table H-2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-82-8	Cumene	1.0E-06	J	1.0E-06	J	MG/M3	IS49SB010405	1/10	N/A	1.0E-06	N/A	4.0E-01 N	N/A	N/A	NO	BSL
127-18-4	Tetrachloroethene	3.0E-06	J	1.6E-05		MG/M3	IS49SB010405	2/10	N/A	1.6E-05	N/A	6.3E-04 C	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	7.3E-07	J	7.3E-07	J	MG/M3	IS49SB010405	1/10	N/A	7.3E-07	N/A	1.6E-05 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	4.8E-09	J	5.5E-09	J	MG/M3	IS53SB170102	2/10	N/A	5.5E-09	N/A	7.3E-02 N	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	5.4E-09	J	1.2E-08	J	MG/M3	IS53SB170102	6/10	N/A	1.2E-08	N/A	3.7E-02 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	1.3E-07	J	4.2E-07	J	MG/M3	IS53SB170102	3/10	N/A	4.2E-07	N/A	2.9E-01 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	8.1E-09	J	8.1E-09	J	MG/M3	IS49SB010405	1/10	N/A	8.1E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.9E-10	J	4.3E-10	J	MG/M3	IS53SB130304	5/10	N/A	4.3E-10	N/A	4.5E-04 C	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	8.3E-10		8.3E-10		MG/M3	IS53SB170102	1/10	N/A	8.3E-10	N/A	3.7E-03 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	4.5E-09		4.5E-09		MG/M3	IS49SB010405	1/10	N/A	4.5E-09	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2.0E-06		1.3E-05	J	MG/M3	IS53SB210607	28/28	N/A	1.3E-05	N/A	3.7E-04 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	5.8E-10	J	1.2E-09	J	MG/M3	IS53SB110406 IS53SB220405	13/28	N/A	1.2E-09	N/A	1.5E-04 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	9.1E-10	J	1.9E-08		MG/M3	IS49SB010405	24/28	N/A	1.9E-08	N/A	4.1E-07 C	N/A	N/A	NO	BSL
7440-39-3	Barium	1.1E-08	J	4.4E-08		MG/M3	IS53SB191214	28/28	N/A	4.4E-08	N/A	5.1E-05 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	6.8E-11	J	5.0E-10	J	MG/M3	IS53SB071415	18/28	N/A	5.0E-10	N/A	7.5E-07 C	N/A	N/A	NO	BSL
7440-70-2	Calcium	3.8E-08	J	1.6E-06		MG/M3	IS53SB061214	28/28	N/A	1.6E-06	N/A	NA	N/A	N/A	NO	NUT
7440-47-3	Chromium	1.2E-09	J	2.5E-08		MG/M3	IS53SB110406	28/28	N/A	2.5E-08	N/A	1.5E-07 C	N/A	N/A	NO	BSL
7440-48-4	Cobalt	3.7E-10	J	6.1E-09	J	MG/M3	IS53SB100405	27/28	N/A	6.1E-09	N/A	2.1E-05 N	N/A	N/A	NO	BSL
7440-50-8	Copper	1.3E-09	J	4.6E-08		MG/M3	IS53SB100405	28/28	N/A	4.6E-08	N/A	1.5E-02 N	N/A	N/A	NO	BSL
7439-89-6	Iron	7.3E-07		3.8E-05		MG/M3	IS53SB110406	28/28	N/A	3.8E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7439-92-1	Lead	4.2E-09		3.4E-07		MG/M3	IS53SB100405	28/28	N/A	3.4E-07	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	5.3E-08	J	5.9E-07	J	MG/M3	IS53SB170102	28/28	N/A	5.9E-07	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	4.2E-10	J	1.3E-07		MG/M3	IS53SB081314	28/28	N/A	1.3E-07	N/A	5.2E-06 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	3.7E-06	J	8.4E-03	J	MG/M3	IS53SB130304	16/28	N/A	8.4E-03	N/A	3.1E-05 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	3.2E-10	J	4.5E-09	J	MG/M3	IS49SB010405	24/28	N/A	4.5E-09	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	6.0E-08	J	9.1E-07	J	MG/M3	IS53SB191214	28/28	N/A	9.1E-07	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	6.1E-10	J	1.7E-09		MG/M3	IS53SB200506	5/28	N/A	1.7E-09	N/A	1.8E-02 N	N/A	N/A	NO	BSL
7440-22-4	Silver	2.8E-10	J	1.5E-09	J	MG/M3	IS53SB110406	23/28	N/A	1.5E-09	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	4.8E-08	J	1.4E-07	J	MG/M3	IS53SB031416	7/28	N/A	1.4E-07	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	8.3E-10	J	1.7E-09	J	MG/M3	IS53SB230708	4/28	N/A	1.7E-09	N/A	2.6E-05 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	1.0E-08		3.9E-08		MG/M3	IS53SB110406	25/28	N/A	3.9E-08	N/A	2.6E-03 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	2.6E-09	J	1.0E-07		MG/M3	IS53SB170102	28/28	N/A	1.0E-07	N/A	1.1E-01 N	N/A	N/A	NO	BSL

Table H-2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table H-2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Lab Area, Naval District Washington, Indian Head

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)
Volatile Organics								
Cumene	7.50E-02	2.62E-01	7.80E-06	3.63E+02	2.18E+00	1.50E+02	4.50E-04	7.74E+03
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	1.50E+02	2.47E-03	3.31E+03
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	1.51E-03	4.23E+03
Butylbenzylphthalate	1.74E-02	5.17E-05	4.83E-06	5.75E+04	3.45E02	2.69E+00	2.28E-10	1.09E+07
Di-n-butylphthalate	4.38E-02	3.85E-08	7.86E-06	3.39E+04	2.03E02	1.12E+01	2.46E-10	1.05E+07
Diethylphthalate	2.56E-02	1.85E-05	6.35E-06	2.88E+02	1.73E00	1.08E+03	3.59E-08	8.68E+05
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	4.93E+06
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	2.81E+08
4-Nitrotoluene	N/A	5.77E-06	N/A	1.51E+01	9.08E-02	1.60E+03	N/A	N/A
Nitrocellulose	N/A							N/A
Mercury	3.07E-02	4.67E-01	6.30E-06		5.20E01		1.46E-05	4.29E+04

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table H-2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	0.005	J	0.043		MG/KG	IS53SD09	2/8	0.011 - 0.036	0.043	N/A	123 C	N/A	N/A	NO	BSL
106-44-5	3- and 4-Methylphenol	0.088	J	0.088	J	MG/KG	IS53SD04	1/8	0.35 - 1.2	0.088	N/A	390 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.069	J	0.51		MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.51	N/A	8.75 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	0.42	J	0.47		MG/KG	IS53SD10P	2/8	0.35 - 1.2	0.47	N/A	0.875 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	0.069	J	0.68	J	MG/KG	IS53SD09	3/8	0.35 - 1.2	0.68	N/A	8.75 C	N/A	N/A	NO	BSL
191-24-2	Benzo(g,h,i)perylene	0.17	J	0.19	J	MG/KG	IS53SD09	2/8	0.35 - 1.2	0.19	N/A	2,346 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	0.31	J	0.31	J	MG/KG	IS53SD09 IS53SD10P	2/8	0.35 - 1.2	0.31	N/A	87.5 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.047	J	0.15	J	MG/KG	IS53SD09	3/8	0.35 - 1.2	0.15	N/A	15,643 N	N/A	N/A	NO	BSL
218-01-9	Chrysene	0.47	J	0.55		MG/KG	IS53SD10P	2/8	0.35 - 1.2	0.55	N/A	875 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.067	J	0.35	J	MG/KG	IS53SD09	4/8	0.35 - 1.2	0.35	N/A	7,821 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.047	J	3.5		MG/KG	IS53SD10	6/8	0.35 - 1.2	3.5	N/A	62,571 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	0.081	J	0.28	J	MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.28	N/A	3,129 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.19	J	0.22	J	MG/KG	IS53SD09	2/8	0.35 - 1.2	0.22	N/A	8.75 C	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.074	J	0.29	J	MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.29	N/A	2,346 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.075	J	0.34	J	MG/KG	IS53SD09	6/8	0.35 - 1.2	0.34	N/A	456 C	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	5		10		MG/KG	IS53SD09	2/8	2.7 - 8.96	10	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	712	J	5,730	J	MG/KG	IS53SD06	8/8	4.1 - 14	5730	N/A	78,214 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	1.6	J	5.8	J	MG/KG	IS53SD07	4/8	1 - 3.5	5.8	N/A	31.3 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.5	L	16.9	L	MG/KG	IS53SD01	8/8	0.79 - 2.7	16.9	N/A	4.26 C	N/A	N/A	YES	ASL
7440-39-3	Barium	18.5	J	222	J	MG/KG	IS53SD09	8/8	0.043 - 0.14	222	N/A	5,475 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.06	J	0.33	J	MG/KG	IS53SD06 IS53SD09	8/8	0.021 - 0.072	0.33	N/A	156 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	0.27	J	4.5		MG/KG	IS53SD06	7/8	0.085 - 0.29	4.5	N/A	39.1 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	1,700	J	127,000	J	MG/KG	IS53SD10	8/8	3.4 - 11	127000	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	6.7	L	109	L	MG/KG	IS53SD05	8/8	0.15 - 0.5	109	N/A	235 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	2.3	J	13.3		MG/KG	IS53SD05	8/8	0.23 - 0.79	13.3	N/A	1,600 N	N/A	N/A	NO	BSL
7440-50-8	Copper	8.6		366		MG/KG	IS53SD06	8/8	0.15 - 0.5	366	N/A	3,129 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	12.3		12.3		MG/KG	IS53SD10P	1/8	0.53 - 1.8	12.34	N/A	1,564 N	N/A	N/A	NO	BSL
7439-89-6	Iron	5,840		99,000		MG/KG	IS53SD05	8/8	3.4 - 11	99000	N/A	23,464 N	N/A	N/A	YES	ASL
7439-92-1	Lead	28.7	J	1,510	J	MG/KG	IS53SD04	8/8	0.43 - 1.4	1,510	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	605	J	87,400		MG/KG	IS53SD10	8/8	2.9 - 9.7	87400	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	43.6	L	2,430	L	MG/KG	IS53SD01	8/8	0.064 - 0.22	2430	N/A	1,564 N	N/A	N/A	YES	ASL

Table H-2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-97-6	Mercury	0.34		1,290		MG/KG	IS53SD04	8/8	0.04 - 38	1290	N/A	23.5 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	5.2	J	70.8		MG/KG	IS53SD05	8/8	0.43 - 1.4	70.8	N/A	1,564 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	45.7	J	1,270	J	MG/KG	IS53SD09	8/8	6.6 - 22.2	1270	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	1.8	L	1.8	L	MG/KG	IS53SD06	1/1	0.94 - 0.94	1.8	N/A	391 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.34	L	63.6	L	MG/KG	IS53SD04	6/8	0.13 - 0.43	63.6	N/A	391 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	84.1	J	670	J	MG/KG	IS53SD09	7/8	66 - 220	670	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	0.71	J	2.9	J	MG/KG	IS53SD06	3/8	0.49 - 1.6	2.9	N/A	5.48 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	4.2	J	45		MG/KG	IS53SD07	8/8	7.4 - 25	45	N/A	548 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	159		1,680		MG/KG	IS53SD06	8/8	0.32 - 1.1	1680	N/A	23,464 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ten times the residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for 4-Methylphenol used for 3- and 4-Methylphenol because it is more conservative.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	0.005	J	0.043		MG/KG	IS53SD09	2/8	0.011 - 0.036	0.043	N/A	123 C	N/A	N/A	NO	BSL
106-44-5	3- and 4-Methylphenol	0.088	J	0.088	J	MG/KG	IS53SD04	1/8	0.35 - 1.2	0.088	N/A	390 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.069	J	0.51		MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.51	N/A	8.75 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	0.42	J	0.47		MG/KG	IS53SD10P	2/8	0.35 - 1.2	0.47	N/A	0.875 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	0.069	J	0.68	J	MG/KG	IS53SD09	3/8	0.35 - 1.2	0.68	N/A	8.75 C	N/A	N/A	NO	BSL
191-24-2	Benzo(g,h,i)perylene	0.17	J	0.19	J	MG/KG	IS53SD09	2/8	0.35 - 1.2	0.19	N/A	2,346 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	0.31	J	0.31	J	MG/KG	IS53SD09 IS53SD10P	2/8	0.35 - 1.2	0.31	N/A	87.5 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.047	J	0.15	J	MG/KG	IS53SD09	3/8	0.35 - 1.2	0.15	N/A	15,643 N	N/A	N/A	NO	BSL
218-01-9	Chrysene	0.47	J	0.55		MG/KG	IS53SD10P	2/8	0.35 - 1.2	0.55	N/A	875 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.067	J	0.35	J	MG/KG	IS53SD09	4/8	0.35 - 1.2	0.35	N/A	7,821 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.047	J	3.5		MG/KG	IS53SD10	6/8	0.35 - 1.2	3.5	N/A	62,571 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	0.081	J	0.28	J	MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.28	N/A	3,129 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.19	J	0.22	J	MG/KG	IS53SD09	2/8	0.35 - 1.2	0.22	N/A	8.75 C	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.074	J	0.29	J	MG/KG	IS53SD10P	3/8	0.35 - 1.2	0.29	N/A	2,346 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.075	J	0.34	J	MG/KG	IS53SD09	6/8	0.35 - 1.2	0.34	N/A	456 C	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	5		10		MG/KG	IS53SD09	2/8	2.7 - 8.96	10	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	712	J	5,730	J	MG/KG	IS53SD06	8/8	4.1 - 14	5730	N/A	78,214 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	1.6	J	5.8	J	MG/KG	IS53SD07	4/8	1 - 3.5	5.8	N/A	31.3 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.5	L	16.9	L	MG/KG	IS53SD01	8/8	0.79 - 2.7	16.9	N/A	4.26 C	N/A	N/A	YES	ASL
7440-39-3	Barium	18.5	J	222	J	MG/KG	IS53SD09	8/8	0.043 - 0.14	222	N/A	5,475 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.06	J	0.33	J	MG/KG	IS53SD06 IS53SD09	8/8	0.021 - 0.072	0.33	N/A	156 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	0.27	J	4.5		MG/KG	IS53SD06	7/8	0.085 - 0.29	4.5	N/A	39.1 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	1,700	J	127,000	J	MG/KG	IS53SD10	8/8	3.4 - 11	127000	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	6.7	L	109	L	MG/KG	IS53SD05	8/8	0.15 - 0.5	109	N/A	235 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	2.3	J	13.3		MG/KG	IS53SD05	8/8	0.23 - 0.79	13.3	N/A	1,600 N	N/A	N/A	NO	BSL
7440-50-8	Copper	8.6		366		MG/KG	IS53SD06	8/8	0.15 - 0.5	366	N/A	3,129 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	12.3		12.3		MG/KG	IS53SD10P	1/8	0.53 - 1.8	12.34	N/A	1,564 N	N/A	N/A	NO	BSL
7439-89-6	Iron	5,840		99,000		MG/KG	IS53SD05	8/8	3.4 - 11	99000	N/A	23,464 N	N/A	N/A	YES	ASL
7439-92-1	Lead	28.7	J	1,510	J	MG/KG	IS53SD04	8/8	0.43 - 1.4	1510	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	605	J	87,400		MG/KG	IS53SD10	8/8	2.9 - 9.7	87400	N/A	N/A	N/A	N/A	NO	NUT

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7439-96-5	Manganese	43.6	L	2,430	L	MG/KG	IS53SD01	8/8	0.064 - 0.22	2430	N/A	1,564 N	N/A	N/A	YES	ASL
7439-97-6	Mercury	0.34		1,290		MG/KG	IS53SD04	8/8	0.04 - 38	1290	N/A	23.5 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	5.2	J	70.8		MG/KG	IS53SD05	8/8	0.43 - 1.4	70.8	N/A	1,564 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	45.7	J	1,270	J	MG/KG	IS53SD09	8/8	6.6 - 22.2	1270	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	1.8	L	1.8	L	MG/KG	IS53SD06	1/1	0.94 - 0.94	1.8	N/A	391 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.34	L	63.6	L	MG/KG	IS53SD04	6/8	0.13 - 0.43	63.6	N/A	391 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	84.1	J	670	J	MG/KG	IS53SD09	7/8	66 - 220	670	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	0.71	J	2.9	J	MG/KG	IS53SD06	3/8	0.49 - 1.6	2.9	N/A	5.48 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	4.2	J	45		MG/KG	IS53SD07	8/8	7.4 - 25	45	N/A	548 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	159		1,680		MG/KG	IS53SD06	8/8	0.32 - 1.1	1680	N/A	23,464 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ten times the residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for 4-Methylphenol used for 3- and 4-Methylphenol because it is more conservative.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-82-8	Cumene	0.0079	J	0.0079	J	MG/KG	IS49SB010405	1/10	0.011 - 0.013	0.0079	N/A	782 N	N/A	N/A	NO	BSL
127-18-4	Tetrachloroethene	0.0099	J	0.054		MG/KG	IS49SB010405	2/10	0.011 - 0.013	0.054	N/A	12.3 C	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	0.0031	J	0.0031	J	MG/KG	IS49SB010405	1/10	0.011 - 0.013	0.0031	N/A	46.9 N!	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.052	J	0.059	J	MG/KG	IS53SB170102	2/10	0.38 - 0.42	0.059	N/A	1,564 N	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.056	J	0.12	J	MG/KG	IS53SB170102	6/10	0.38 - 0.42	0.12	N/A	782 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.11	J	0.36	J	MG/KG	IS53SB170102	3/10	0.38 - 0.42	0.36	N/A	6,257 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.04	J	0.04	J	MG/KG	IS49SB010405	1/10	0.38 - 0.42	0.04	N/A	235 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.043	J	0.099	J	MG/KG	IS53SB130304	5/10	0.38 - 0.42	0.099	N/A	45.6 C	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	1.1		1.1		MG/KG	IS53SB170102	1/10	0.56 - 0.62	1.1	N/A	78 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	5.9		5.9		MG/KG	IS49SB010405	1/10	2.9 - 3.2	5.9	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2,600		16,500	J	MG/KG	IS53SB210607	28/28	1.7 - 2	16500	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	0.76	J	1.6	J	MG/KG	IS53SB110406 IS53SB220405	13/28	0.67 - 0.78	1.6	N/A	3.13 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	1.2	J	25.1		MG/KG	IS49SB010405	24/28	0.54 - 0.63	25.1	N/A	0.426 C	N/A	N/A	YES	ASL
7440-39-3	Barium	14.9	J	57.7		MG/KG	IS53SB191214	28/28	0.065 - 0.076	57.7	N/A	548 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.09	J	0.66	J	MG/KG	IS53SB071415	18/28	0.022 - 0.03	0.66	N/A	15.6 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	50	J	2,160		MG/KG	IS53SB061214	28/28	0.67 - 0.78	2160	N/A	NA	N/A	N/A	NO	NUT
7440-47-3	Chromium	1.6	J	32.6		MG/KG	IS53SB110406	28/28	0.17 - 0.2	32.6	N/A	23.5 N	N/A	N/A	YES	ASL
7440-48-4	Cobalt	0.49	J	8	J	MG/KG	IS53SB100405	27/28	0.22 - 0.25	8	N/A	160 N	N/A	N/A	NO	BSL
7440-50-8	Copper	1.7	J	61.1		MG/KG	IS53SB100405	28/28	0.17 - 0.2	61.1	N/A	313 N	N/A	N/A	NO	BSL
7439-89-6	Iron	969		49,500		MG/KG	IS53SB110406	28/28	3.2 - 3.7	49500	N/A	2,346 N	N/A	N/A	YES	ASL
7439-92-1	Lead	5.6		443		MG/KG	IS53SB100405	28/28	0.54 - 0.63	443	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	69.8	J	784	J	MG/KG	IS53SB170102	28/28	1.7 - 2	784	N/A	NA	N/A	N/A	NO	NUT
7439-96-5	Manganese	0.56	J	172		MG/KG	IS53SB081314	28/28	0.043 - 0.051	172	N/A	156 N	N/A	N/A	YES	ASL
7439-97-6	Mercury	0.16	J	362	J	MG/KG	IS53SB130304	16/28	0.1 - 10	362	N/A	2.35 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	0.42	J	5.9	J	MG/KG	IS49SB010405	24/28	0.37 - 0.43	5.9	N/A	156 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	79.3	J	1,200	J	MG/KG	IS53SB191214	28/28	6.8 - 7.9	1200	N/A	NA	N/A	N/A	NO	NUT
7782-49-2	Selenium	0.8	J	2.3		MG/KG	IS53SB200506	5/28	0.69 - 0.81	2.3	N/A	39.1 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.37	J	2	J	MG/KG	IS53SB110406	23/28	0.28 - 0.33	2	N/A	39.1 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	63.4	J	189	J	MG/KG	IS53SB031416	7/28	58 - 68	189	N/A	NA	N/A	N/A	NO	NUT
7440-28-0	Thallium	1.1	J	2.3	J	MG/KG	IS53SB230708	4/28	0.84 - 0.99	2.3	N/A	0.548 N	N/A	N/A	YES	ASL
7440-62-2	Vanadium	13.7		51.9		MG/KG	IS53SB110406	25/28	7.6 - 8.9	51.9	N/A	54.8 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	3.4	J	134		MG/KG	IS53SB170102	28/28	0.11 - 0.13	134	N/A	2,346 N	N/A	N/A	NO	BSL

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Residential soil RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for Chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
98-82-8	Cumene	1.0E-06	J	1.0E-06	J	MG/M3	IS49SB010405	1/10	N/A	1.0E-06	N/A	4.0E-01 N	N/A	N/A	NO	BSL
127-18-4	Tetrachloroethene	3.0E-06	J	1.6E-05		MG/M3	IS49SB010405	2/10	N/A	1.6E-05	N/A	6.3E-04 C	N/A	N/A	NO	BSL
79-01-6	Trichloroethene	7.3E-07	J	7.3E-07	J	MG/M3	IS49SB010405	1/10	N/A	7.3E-07	N/A	1.6E-05 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	4.8E-09	J	5.5E-09	J	MG/M3	IS53SB170102	2/10	N/A	5.5E-09	N/A	7.3E-02 N	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	5.4E-09	J	1.2E-08	J	MG/M3	IS53SB170102	6/10	N/A	1.2E-08	N/A	3.7E-02 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	1.3E-07	J	4.2E-07	J	MG/M3	IS53SB170102	3/10	N/A	4.2E-07	N/A	2.9E-01 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	8.1E-09	J	8.1E-09	J	MG/M3	IS49SB010405	1/10	N/A	8.1E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.9E-10	J	4.3E-10	J	MG/M3	IS53SB130304	5/10	N/A	4.3E-10	N/A	4.5E-04 C	N/A	N/A	NO	BSL
99-99-0	4-Nitrotoluene	8.3E-10		8.3E-10		MG/M3	IS53SB170102	1/10	N/A	8.3E-10	N/A	3.7E-03 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	4.5E-09		4.5E-09		MG/M3	IS49SB010405	1/10	N/A	4.5E-09	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	2.0E-06		1.3E-05	J	MG/M3	IS53SB210607	28/28	N/A	1.3E-05	N/A	3.7E-04 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	5.8E-10	J	1.2E-09	J	MG/M3	IS53SB110406 IS53SB220405	13/28	N/A	1.2E-09	N/A	1.5E-04 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	9.1E-10	J	1.9E-08		MG/M3	IS49SB010405	24/28	N/A	1.9E-08	N/A	4.1E-07 C	N/A	N/A	NO	BSL
7440-39-3	Barium	1.1E-08	J	4.4E-08		MG/M3	IS53SB191214	28/28	N/A	4.4E-08	N/A	5.1E-05 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	6.8E-11	J	5.0E-10	J	MG/M3	IS53SB071415	18/28	N/A	5.0E-10	N/A	7.5E-07 C	N/A	N/A	NO	BSL
7440-70-2	Calcium	3.8E-08	J	1.6E-06		MG/M3	IS53SB061214	28/28	N/A	1.6E-06	N/A	NA	N/A	N/A	NO	NUT
7440-47-3	Chromium	1.2E-09	J	2.5E-08		MG/M3	IS53SB110406	28/28	N/A	2.5E-08	N/A	1.5E-07 C	N/A	N/A	NO	BSL
7440-48-4	Cobalt	3.7E-10	J	6.1E-09	J	MG/M3	IS53SB100405	27/28	N/A	6.1E-09	N/A	2.1E-05 N	N/A	N/A	NO	BSL
7440-50-8	Copper	1.3E-09	J	4.6E-08		MG/M3	IS53SB100405	28/28	N/A	4.6E-08	N/A	1.5E-02 N	N/A	N/A	NO	BSL
7439-89-6	Iron	7.3E-07		3.8E-05		MG/M3	IS53SB110406	28/28	N/A	3.8E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7439-92-1	Lead	4.2E-09		3.4E-07		MG/M3	IS53SB100405	28/28	N/A	3.4E-07	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	5.3E-08	J	5.9E-07	J	MG/M3	IS53SB170102	28/28	N/A	5.9E-07	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	4.2E-10	J	1.3E-07		MG/M3	IS53SB081314	28/28	N/A	1.3E-07	N/A	5.2E-06 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	3.7E-06	J	8.4E-03	J	MG/M3	IS53SB130304	16/28	N/A	8.4E-03	N/A	3.1E-05 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	3.2E-10	J	4.5E-09	J	MG/M3	IS49SB010405	24/28	N/A	4.5E-09	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	6.0E-08	J	9.1E-07	J	MG/M3	IS53SB191214	28/28	N/A	9.1E-07	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	6.1E-10	J	1.7E-09		MG/M3	IS53SB200506	5/28	N/A	1.7E-09	N/A	1.8E-02 N	N/A	N/A	NO	BSL
7440-22-4	Silver	2.8E-10	J	1.5E-09	J	MG/M3	IS53SB110406	23/28	N/A	1.5E-09	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	4.8E-08	J	1.4E-07	J	MG/M3	IS53SB031416	7/28	N/A	1.4E-07	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	8.3E-10	J	1.7E-09	J	MG/M3	IS53SB230708	4/28	N/A	1.7E-09	N/A	2.6E-05 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	1.0E-08		3.9E-08		MG/M3	IS53SB110406	25/28	N/A	3.9E-08	N/A	2.6E-03 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	2.6E-09	J	1.0E-07		MG/M3	IS53SB170102	28/28	N/A	1.0E-07	N/A	1.1E-01 N	N/A	N/A	NO	BSL

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[1] Minimum/maximum detected soil concentration multiplied by 1/PEF + 1/VF. PEF = 1.32E+9 m3/kg, VF = chemical specific for VOCs only.
PEF from EPA's Soil Screening Guidance and VF calculated on Table 2.2.A.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for chromium VI used for total chromium.
RBC value for mercuric chloride used for mercury.
[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Lab Area, Naval District Washington, Indian Head

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)
Volatile Organics								
Cumene	7.50E-02	2.62E-01	7.80E-06	3.63E+02	2.18E+00	1.50E+02	4.50E-04	7.74E+03
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	1.50E+02	2.47E-03	3.31E+03
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	1.51E-03	4.23E+03
Butylbenzylphthalate	1.74E-02	5.17E-05	4.83E-06	5.75E+04	3.45E02	2.69E+00	2.28E-10	1.09E+07
Di-n-butylphthalate	4.38E-02	3.85E-08	7.86E-06	3.39E+04	2.03E02	1.12E+01	2.46E-10	1.05E+07
Diethylphthalate	2.56E-02	1.85E-05	6.35E-06	2.88E+02	1.73E00	1.08E+03	3.59E-08	8.68E+05
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	4.93E+06
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	2.81E+08
4-Nitrotoluene	N/A	5.77E-06	N/A	1.51E+01	9.08E-02	1.60E+03	N/A	N/A
Nitrocellulose	N/A							
Mercury	3.07E-02	4.67E-01	6.30E-06		5.20E01		1.46E-05	4.29E+04

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	MG/KG	9,454	10,780	16,500	J	MG/KG	10,780	95% UCL-N	(4)	9,454	Mean-N	(4)
Arsenic	MG/KG	5.83	7.52	25.1		MG/KG	14.4	95% UCL-T	(4)	3.49	Mean-T	(4)
Chromium	MG/KG	15.1	17.1	32.6		MG/KG	17.1	95% UCL-N	(3)	15.1	Mean-N	(3)
Iron	MG/KG	19,662	23,023	49,500		MG/KG	23,023	95% UCL-N	(3)	19,662	Mean-N	(3)
Lead	MG/KG	30.2	56.5	443		MG/KG	14.3	Mean-T	(4)	14.3	Mean-T	(4)
Manganese	MG/KG	49.7	63.7	172		MG/KG	63.7	95% UCL-N	(4)	49.7	Mean-N	(4)
Mercury	MG/KG	15.6	37.5	362	J	MG/KG	46.9	95% UCL-T	(4)	0.40	Mean-T	(4)
Thallium	MG/KG	0.646	0.800	2.30	J	MG/KG	0.74	95% UCL-T	(4)	0.56	Mean-T	(4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Mercury	MG/KG	15.6	37.5	362	J	MG/KG	46.9	95% UCL-T	(4)	0.40	Mean-T	(4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	MG/KG	7.30	10.8	16.9	L	MG/KG	16.9	Max.	(2)	5.7	Mean-T	(4)
Iron	MG/KG	27,874	47,946	99,000		MG/KG	77,066	95% UCL-T	(1)	19,536	Mean-T	(1)
Lead	MG/KG	329	656	1,510	J	MG/KG	167	Mean-T	(1)	167	Mean-T	(1)
Manganese	MG/KG	709	1,250	2,430	L	MG/KG	2430	Max.	(2)	358	Mean-T	(1)
Mercury	MG/KG	266	568	1,290		MG/KG	1,290	Max.	(2)	25.3	Mean-T	(1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	MG/KG	7.30	10.8	16.9	L	MG/KG	16.9	Max.	(2)	5.7	Mean-T	(4)
Iron	MG/KG	27,874	47,946	99,000		MG/KG	77,066	95% UCL-T	(1)	19,536	Mean-T	(1)
Lead	MG/KG	329	656	1,510	J	MG/KG	1,510	Max.	(2)	167	Mean-T	(1)
Manganese	MG/KG	709	1,250	2,430	L	MG/KG	2430	Max.	(2)	358	Mean-T	(1)
Mercury	MG/KG	266	568	1,290		MG/KG	1,290	Max.	(2)	25.3	Mean-T	(1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Aluminum	MG/KG	9,454	10,780	16,500	J	MG/KG	10,780	95% UCL-N	(4)	9,454	Mean-N	(4)
Arsenic	MG/KG	5.83	7.52	25.1		MG/KG	14.4	95% UCL-T	(4)	3.49	Mean-T	(4)
Chromium	MG/KG	15.1	17.1	32.6		MG/KG	17.1	95% UCL-N	(3)	15.1	Mean-N	(3)
Iron	MG/KG	19,662	23,023	49,500		MG/KG	23,023	95% UCL-N	(3)	19,662	Mean-N	(3)
Lead	MG/KG	30.2	56.5	443		MG/KG	14.3	Mean-T	(4)	14.3	Mean-T	(4)
Manganese	MG/KG	49.7	63.7	172		MG/KG	63.7	95% UCL-N	(4)	49.7	Mean-N	(4)
Mercury	MG/KG	15.6	37.5	362	J	MG/KG	46.9	95% UCL-T	(4)	0.40	Mean-T	(4)
Thallium	MG/KG	0.646	0.800	2.30	J	MG/KG	0.74	95% UCL-T	(4)	0.56	Mean-T	(4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Mercury	MG/KG	15.6	37.5	362	J	MG/KG	46.9	95% UCL-T	(4)	0.40	Mean-T	(4)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	30	(3)	24	(3)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992 (1)	2,000	EPA, 1992 (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997 (2)	0.3	EPA, 1997 (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	30	(3)	24	(3)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(2) RME SSAF is soil adherence to hands for Utility Workers No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to hands Utility Workers No. 1 and No. 2 from EPA, 1997, Table 6-12.

(3) RME EF is based on professional judgement assuming, waterline repair work to happen once in two weeks/year (4 hrs repair time), 5 sewer lines repair/year (4hrs repair time), and 5 manholes repair/year (3 days repair time); CT EF is waterline repair work to happen once in two weeks/year (4 hrs repair time), 3 sewer lines repair/year (4hrs repair time), and 3 manholes repair/year (3 days repair time).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF is based on maximum adherence factor for utility workers.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.2	- -	see Table 2.2	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.5	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	$CA (mg/m^3) = CS (1/PEF + 1/VF)$
	EF	Exposure Frequency	days/year	30	(3)	24	(3)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate for adult, sedentary activities.

(3) RME EF is based on professional judgement assuming, waterline repair work to happen once in two weeks/year (4 hrs repair time), 5 sewer lines repair/year (4hrs repair time), and 5 manholes repair/year (3 days repair time); CT EF is waterline repair work to happen once in two weeks/year (4 hrs repair time), 3 sewer lines repair/year (4hrs repair time), and 3 manholes repair/year (3 days repair time).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Risk-Based Concentration Table. October 27, 1999.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer Lines
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3		see Table 3.3	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	100	EPA, 1993	50	EPA, 1993	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	30	(1)	24	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3		see Table 3.3		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,050	EPA, 1997	1,960	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.36	EPA, 1997, (3)	0.26	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	30	(1)	24	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) RME EF is based on professional judgement assuming, waterline repair work to happen once in two weeks/year (4 hrs repair time), 5 sewer lines repair/year (4hrs repair time), and 5 manholes repair/year (3 days repair t
CT EF is waterline repair work to happen once in two weeks/year (4 hrs repair time), 3 sewer lines repair/year (4hrs repair time), and 3 manholes repair/year (3 days repair time).

(2) RME SA is the sum of the mean surface areas (for a male) of the hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the feet and hands.
(Skin surface area in contact with sediment based on contact while wading).

(3) RME SSAF is soil adherence to legs for Rugby No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to legs Rugby No. 1 and No. 2 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on EPA's Risk Assessment Guidance for Superfund Vol. 1: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance, November 1998.

For constituents with no specific values, used default volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer Lines
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.4		see Table 3.4	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	100	EPA, 1993	50	EPA, 1993	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	15	(1)	15	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.4		see Table 3.4		CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,050	EPA, 1997	1,960	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.36	EPA, 1997, (3)	0.26	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	15	(1)	15	(1)	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) Professional Judgement based on maintenance of the water laterals, sewer lines and manholes that would occur 3 times per year for 5 days per time.

(2) RME SA is the sum of the mean surface areas (for a male) of the hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the feet and hands.

(Skin surface area in contact with sediment based on contact while wading).

(3) RME SSAF is soil adherence to legs for Rugby No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to legs Rugby No. 1 and No. 2 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on EPA's Risk Assessment Guidance for Superfund Vol. 1: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance, November 1998.

For constituents with no specific values, used default volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	100	EPA, 1997	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992 (2)	2,000	EPA, 1992 (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.24	EPA, 1997 (3)	0.18	EPA, 1997 (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Not available, used RME value.

(2) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(3) RME SSAF is soil adherence to hands for Construction Workers from EPA, 1997, Table 6-12. CT is 0.75 times the RME per discussions with EPA and NEHC on November 22, 1999.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF is based on maximum adherence factor for construction workers.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992 (1)	2,000	EPA, 1992 (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997 (2)	0.3	EPA, 1997 (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(2) RME SSAF is soil adherence to hands for Utility Workers No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to hands Utility Workers No. 1 and No. 2 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF is based on maximum adherence factor for utility workers.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,800	EPA, 1997	5,000	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

SA: Based on 25% of total body surface area for adult (25% of 23,000 cm^2 for RME and 25% of 20,000 cm^2 for CT).

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	2,379	EPA, 1997	2,094	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997	0.11	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

SA: Skin surface area for the RME is based on the 50th percentile total surface area for the child ages 5-6 years (Table 6-6 of EPA, 1999). The CT value is based on the average between the 50th percentile surface areas for the child ages 2-3 years and 5-6 years.

SSAF is the maximum adherence factor for scccer player.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF based on maximum adherence factor for soccer players.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	5,800	EPA, 1992	5,000	EPA, 1992	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	2,379	EPA, 1997	2,094	EPA, 1997	
	SSAF-A	Soil to Skin Adherence Factor, Adult	mg/cm^2-day	0.2	EPA, 1997a	0.2	EPA, 1992	
	SSAF-C	Soil to Skin Adherence Factor, Child	mg/cm^2-day	0.11	EPA, 1997a	0.11	EPA, 1992	DA-Adj (mg-year/kg-day) =
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	502.39	calculated	220.71	calculated	[(ED-C x SA-C / BW-C)*SSAF-C + (ED-A x SA-A / BW-A)*SSAF-A]
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, semi-volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.5	EPA, 1997 (2)	1.5	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rates are based on values for the outdoor worker assuming heavy activity for the RME and moderate activity for the CT (EPA, 1997, page 5-24).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Calc. (1): Calculated in Appendix--- Section Generation of Fugitive Dust During Construction Activites.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.5	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate for adult, sedentary activities.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Risk-Based Concentration Table. October 27, 1999.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA,1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 15, 16, 49, and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN-S-Adj x ET x EF x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	IN-S-Adj (m^3-year/kg-hour) =
	IN-S-A	Inhalation Rate, Adult	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	(ED-C x IN-S-C / BW-C) + (ED-A x IN-S-A / BW-A)
	IN-S-C	Inhalation Rate, Child	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	IN-S-Adj	Inhalation Rate, Age-adjusted	m^3-year/kg-hour	0.49	calculated	0.31	calculated	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	BW-A	Body Weight, Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	27%	2.7E-01	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/vascular	3/1	IRIS	06/17/1998
	Subchronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/vascular	3	HEAST	07/08/1998
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	1%	3.0E-05	mg/kg-day	NOAEL	300/3	IRIS	09/03/1998
	Subchronic	2.0E-02	mg/kg-day	1%	2.0E-04	mg/kg-day	NOAEL	100	HEAST	07/08/1998
Iron	Chronic	3.0E-01	mg/kg-day	20%	6.0E-02	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Lead	Chronic	N/A								
	Subchronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	35%	7.0E-03	mg/kg-day	CNS	1/1	IRIS	03/12/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	5%	7.0E-03	mg/kg-day	CNS	1/1	IRIS	03/12/2001
	Subchronic	N/A								
Mercury	Chronic	N/A								
Mercuric chloride	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Immune System	1000	IRIS	03/12/2001
	Subchronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Kidney	1000	HEAST	07/1998
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin/vascular	3/1	IRIS	04/10/1998
	Subchronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin	3	HEAST	07/00/97

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation* , April 8, 1999.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	RBC	10/5/2000
	Subchronic	N/A							
Arsenic	Chronic	N/A							
	Subchronic	N/A							
Chromium (hexavalent)	Chronic	1.05E-04	mg/m^3	3.00E-05	mg/kg-day	Respiratory System	90/1	IRIS	09/03/1998
	Subchronic	4.00E-06	mg/m^3	1.14E+06	mg/kg-day	Respiratory System	100	NCEA	05/14/1993
Iron	Chronic	N/A							
	Subchronic	N/A							
Lead	Chronic	N/A							
Manganese	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000/1	IRIS	06/17/1998
	Subchronic	N/A							
Mercury	Chronic	3.01E-04	mg/m^3	8.6E-05	mg/kg-day	CNS	30	IRIS	03/15/2001
	Subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	HEAST	07/1998
Thallium	Chronic	N/A							

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

HEAST(3) = Health Effects Assessment Summary Tables, Alternate Methods

HEAST(4)= Health Effects Assessment Summary Tables, Withdrawn

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	N/A						
Arsenic	1.5E+00	95%	1.6E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	07/08/1998
Chromium (hexavalent)	N/A						
Iron	N/A						
Lead	N/A						
Manganese (food)	N/A						
Manganese (nonfood)	N/A						
Mercury	N/A						
Thallium	N/A						

NU-Did not use the oral slope factor for dermal evaluation because the chemicals may act directly at the point of contact per Memorandum from Jennifer Hubbard, 12/19/96.

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates 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

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation*, April 8, 1999.

Dermal carcinogenicity should not be assessed for the carcinogenic PAHs, as these chemicals may act directly at the point of contact.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide article date provided by NCEA.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	N/A							
Arsenic	4.0E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	06/13/1998
Chromium	1.2E-02	$(ug/m3)^{-1}$	3500	4.1E+01	$(mg/kg\text{-}day)^{-1}$	A	HEAST	06/13/1998
Iron	N/A						NCEA	07/23/1996
Lead	N/A							
Manganese	N/A					D	IRIS	03/08/2001
Mercury	N/A							
Thallium	N/A						RBC	10/05/2000

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
U = Under review.
N/A = Not Available

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates 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 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.3E-03
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.6E-03
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.0E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.7E-04
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	2.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.0E-03
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	7.5E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.7E-04
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.8E-02
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	8.7E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.2E-03
	(Total)												3.7E-02
Dermal Absorption	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.1E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	8.0E-04
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	9.2E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.2E-03
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	3.4E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E-02
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	4.6E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	7.6E-03
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.3E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.8E-04
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	9.3E-07	mg/kg-day	3.0E-04	N/A	N/A	N/A	3.1E-03
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.1E-04
	(Total)												2.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/m3	M	2.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.3E-02
	(Total)												8.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	8.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer Lines
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.6E-03
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	9.0E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.0E-02
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	2.9E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.4E-02
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	1.5E-04	mg/kg-day	3.0E-04	N/A	N/A	N/A	5.0E-01
	(Total)												5.6E-01
Dermal Absorption	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	9.3E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.2E-03
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	1.3E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.2E-02
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	4.2E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.9E-03
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	2.2E-05	mg/kg-day	3.0E-04	N/A	N/A	N/A	7.4E-02
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.6E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,.
N/A - not applicable.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer Lines
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	9.9E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.3E-03
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	4.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	7.1E-03
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	7.6E-05	mg/kg-day	3.0E-04	N/A	N/A	N/A	2.5E-01
	(Total)												2.8E-01
Dermal Absorption	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	4.6E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.6E-03
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	6.6E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.1E-02
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	2.1E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	3.0E-03
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	1.1E-05	mg/kg-day	3.0E-04	N/A	N/A	N/A	3.7E-02
	(Total)												5.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,.
N/A - not applicable.

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	5.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.1E-02
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.3E-01
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	8.0E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.0E-03
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.1E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.6E-01
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	3.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	2.2E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.3E-01
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	3.5E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	5.0E-02
	(Total)												1.4E+00
Dermal Absorption	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.3E-03	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	5.0E-03
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.7E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.0E-02
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.1E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	5.3E-03
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	2.9E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.8E-02
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	7.9E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.1E-03
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	5.8E-06	mg/kg-day	3.0E-04	N/A	N/A	N/A	1.9E-02
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	9.2E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.3E-03
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.1E-02
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.7E-02
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.7E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	5.6E-03
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	2.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.5E-02
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	6.2E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	4.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-01
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	7.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.0E-02
	(Total)												3.0E-01
Dermal Absorption	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.1E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	8.0E-04
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	9.2E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.2E-03
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	3.4E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E-02
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	4.6E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	7.6E-03
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.3E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.8E-04
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	9.3E-07	mg/kg-day	3.0E-04	N/A	N/A	N/A	3.1E-03
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.1E-04
	(Total)												2.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.5E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.5E-02
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.6E-02
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.3E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.8E-03
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	3.2E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.1E-01
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	8.7E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.4E-03
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	6.4E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-01
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.0E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.4E-02
	(Total)												4.3E-01
Dermal Absorption	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.7E-03	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	6.3E-03
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	7.3E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.6E-02
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.7E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	9.1E-02
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	3.7E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	6.1E-02
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.0E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.4E-03
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	7.5E-06	mg/kg-day	3.0E-04	N/A	N/A	N/A	2.5E-02
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.7E-03
	(Total)												2.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.4E-01	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.4E-01
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.8E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.1E-01
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.2E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	7.3E-02
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	2.9E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	9.8E-01
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	8.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.1E-02
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	6.0E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.0E+00
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	9.5E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.4E-01
	(Total)												4.0E+00
Dermal Absorption	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.8E-03	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	6.7E-03
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	7.7E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.7E-02
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.9E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	9.5E-02
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	3.9E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	6.4E-02
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.1E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.5E-03
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	7.8E-06	mg/kg-day	3.0E-04	N/A	N/A	N/A	2.6E-02
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.8E-03
	(Total)												2.2E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/m3	M	2.1E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.1E-01
	(Total)												7.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	7.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/m3	M	7.1E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.4E-01
	(Total)												2.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/m3	M	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.9E-01
	(Total)												9.9E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/m3	M	8.4E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.8E+00
	(Total)												2.8E+00
												Total Hazard Index Across All Exposure Routes/Pathways	2.8E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.13.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	8.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.1E-03
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	3.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-02
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.5E-04
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	1.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.6E-02
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	4.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.1E-03
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	3.4E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-03
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	4.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.9E-03
	(Total)												8.5E-02
Dermal Absorption	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	2.9E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	1.1E-03
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	3.4E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.2E-03
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	4.7E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.6E-02
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	6.1E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.0E-02
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	1.5E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	2.2E-04
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	1.2E-08	mg/kg-day	3.0E-04	N/A	N/A	N/A	4.1E-05
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	1.7E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E-04
	(Total)												2.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.14.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	4.0E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.0E-02
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.0E-02
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.5E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.2E-02
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	8.4E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.8E-01
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	2.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-02
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.7E-03
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	2.4E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.4E-02
	(Total)												4.4E-01
Dermal Absorption	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	9.3E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.4E-03
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	1.1E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	3.9E-03
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	5.0E-02
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	1.9E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.2E-02
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	4.9E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	7.0E-04
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	3.9E-08	mg/kg-day	3.0E-04	N/A	N/A	N/A	1.3E-04
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	5.5E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	7.9E-04
	(Total)												9.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics.
N/A - not applicable.

TABLE 7.15.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.0E-01	mg/kg	9.3E-06	mg/m3	M	4.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	(Total)												1.6E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.6E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	4.5E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	6.0E-07	mg/kg-day	1.5E+00	1/mg/kg/day	9.1E-07
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	7.2E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	9.7E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	2.7E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	3.1E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										9.1E-07
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.7E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	3.3E-07	mg/kg-day	1.6E+00	1/mg/kg/day	5.2E-07
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.6E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	4.5E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	3.3E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	5.3E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										5.2E-07
										Total Risk Across All Exposure Routes/Pathways	1.4E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	3.0E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines
Receptor Population: Other Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	7.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.1E-06
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	3.2E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	1.0E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	5.4E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										1.1E-06
Dermal Absorption											
	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	3.3E-07	mg/kg-day	1.6E+00	1/mg/kg/day	5.2E-07
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	4.7E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	7.9E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										5.2E-07
										Total Risk Across All Exposure Routes/Pathways	1.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Underground Sewer lines
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	3.5E-07	mg/kg-day	1.5E+00	1/mg/kg/day	5.3E-07
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	1.6E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	5.1E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	2.7E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										5.3E-07
Dermal Absorption											
	Arsenic	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.7E-07	mg/kg-day	1.6E+00	1/mg/kg/day	2.6E-07
	Iron	7.7E+04	mg/kg	7.7E+04	mg/kg	M	2.4E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.4E+03	mg/kg	2.4E+03	mg/kg	M	7.4E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	1.3E+03	mg/kg	1.3E+03	mg/kg	M	3.9E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.6E-07
										Total Risk Across All Exposure Routes/Pathways	7.9E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.2E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	9.7E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.4E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.5E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	4.3E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	3.1E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	5.0E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										1.4E-06
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.9E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	8.2E-08	mg/kg-day	1.6E+00	1/mg/kg/day	1.3E-07
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	3.0E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	4.1E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	8.3E-08	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.3E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										1.3E-07
										Total Risk Across All Exposure Routes/Pathways	1.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	3.8E-03	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	5.0E-06	mg/kg-day	1.5E+00	1/mg/kg/day	7.5E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	6.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	8.0E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	2.2E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	1.6E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										7.5E-06
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	6.4E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.7E-06	mg/kg-day	1.6E+00	1/mg/kg/day	4.3E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.4E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	3.8E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	2.8E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										4.3E-06
										Total Risk Across All Exposure Routes/Pathways	1.2E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.5E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.0E-06	mg/kg-day	1.5E+00	1/mg/kg/day	1.5E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.6E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	4.4E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	3.3E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	5.2E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										1.5E-06
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	4.4E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.9E-07	mg/kg-day	1.6E+00	1/mg/kg/day	3.0E-07
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	7.0E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	9.4E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	3.0E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										3.0E-07
										Total Risk Across All Exposure Routes/Pathways	1.8E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	5.3E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	7.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.1E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	8.5E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.1E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	3.2E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	2.3E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	3.7E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										1.1E-06
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	2.7E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	1.2E-07	mg/kg-day	1.6E+00	1/mg/kg/day	1.8E-07
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	4.3E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	5.8E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.9E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										1.8E-07
										Total Risk Across All Exposure Routes/Pathways	1.3E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	1.7E-02	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	2.3E-05	mg/kg-day	1.5E+00	1/mg/kg/day	3.4E-05
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	2.7E-05	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	3.6E-02	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	1.0E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	7.3E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										3.4E-05
Dermal Absorption											
	Aluminum	1.1E+04	mg/kg	1.1E+04	mg/kg	M	7.4E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.4E+01	mg/kg	1.4E+01	mg/kg	M	3.2E-06	mg/kg-day	1.6E+00	1/mg/kg/day	5.0E-06
	Chromium	1.7E+01	mg/kg	1.7E+01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.3E+04	mg/kg	2.3E+04	mg/kg	M	1.6E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	6.4E+01	mg/kg	6.4E+01	mg/kg	M	4.4E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.7E+01	mg/kg	4.7E+01	mg/kg	M	3.2E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	7.4E-01	mg/kg	7.4E-01	mg/kg	M	5.1E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										5.0E-06
										Total Risk Across All Exposure Routes/Pathways	3.9E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	2.5E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	2.7E-01	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	7.2E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Subsurface Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	4.7E+01	mg/kg	1.1E-03	mg/kg	M	1.8E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.15.RME
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	2.9E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	1.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.6E-07
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	4.6E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	6.0E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	1.2E-08	mg/kg-day	N/A	N/A	N/A
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	1.7E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										1.6E-07
Dermal Absorption											
	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	4.1E-08	mg/kg-day	1.6E+00	1/mg/kg/day	6.5E-08
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	5.5E-08	mg/kg-day	N/A	N/A	N/A
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	7.2E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	1.8E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	1.5E-09	mg/kg-day	N/A	N/A	N/A
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	2.1E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										6.5E-08
										Total Risk Across All Exposure Routes/Pathways	2.3E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 8.16.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY EXPOSURE
Sites 15, 16, 49 and 53 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Site Subsurface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	4.0E-03	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	1.5E-06	mg/kg-day	1.5E+00	1/mg/kg/day	2.2E-06
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.4E-06	mg/kg-day	N/A	N/A	N/A
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	8.4E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	2.1E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										2.2E-06
Dermal Absorption											
	Aluminum	9.5E+03	mg/kg	9.5E+03	mg/kg	M	1.9E-04	mg/kg-day	N/A	N/A	N/A
	Arsenic	3.5E+00	mg/kg	3.5E+00	mg/kg	M	2.3E-07	mg/kg-day	1.6E+00	1/mg/kg/day	3.6E-07
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	3.1E-07	mg/kg-day	N/A	N/A	N/A
	Iron	2.0E+04	mg/kg	2.0E+04	mg/kg	M	4.0E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	5.0E+01	mg/kg	5.0E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	4.0E-01	mg/kg	4.0E-01	mg/kg	M	8.1E-09	mg/kg-day	N/A	N/A	N/A
	Thallium	5.6E-01	mg/kg	5.6E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										3.6E-07
										Total Risk Across All Exposure Routes/Pathways	2.6E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 3.2% for arsenic, 1% for all other inorganics,
N/A - not applicable.

TABLE 9.1 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current
Receptor Population: Other Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A	Aluminum	CNS	0.001	N/A	0.001	0.002
			Arsenic	9.1E-07	N/A	5.2E-07	1.4E-06	Arsenic	Skin/vascular	0.006	N/A	0.003	0.009
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.0007	N/A	0.01	0.01
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.009	N/A	0.008	0.02
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.0004	N/A	0.0002	0.0006
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.02	N/A	0.003	0.02
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.001	N/A	0.0002	0.001
			(Total)	9.1E-07	NA	5.2E-07	1.4E-06	(Total)		0.04	N/A	0.03	0.06
			Total Risk Across Subsurface Soil				1.4E-06	Total Hazard Index Across Subsurface Soil					0.06
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.08	N/A	0.08
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.08	N/A	0.08
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.08
			Total Risk Across All Media and All Exposure Routes				1.4E-06	Total Hazard Index Across All Media and All Exposure Routes					0.1

Total CNS HI =	0.09
Total Skin HI =	0.01
Total NOAEL HI =	0.01
Total Gastrointestinal HI =	0.02
Total Immune System HI =	0.02
Total Vascular HI =	0.01

TABLE 9.2 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Undergound Sewer Lines	Arsenic	1.1E-06	N/A	5.2E-07	1.6E-06	Arsenic	Skin/vascular	0.007	N/A	0.003	0.01
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	0.03	N/A	0.02	0.05
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	CNS	0.01	N/A	0.006	0.02
			Mercury	N/A	N/A	N/A	0.0E+00	Mercury	Immune System	0.5	N/A	0.07	0.6
			(Total)	1.1E-06	NA	5.2E-07	1.6E-06	(Total)		0.6	N/A	0.1	0.7
			Total Risk Across Sediment				1.6E-06	Total Hazard Index Across Sediment					0.7
Total Risk Across All Media and All Exposure Routes							1.6E-06	Total Hazard Index Across All Media and All Exposure Routes					0.7

Total Skin HI =	0.01
Total Gastrointestinal HI =	0.05
Total CNS HI =	0.02
Total Immune System HI =	0.6
Total Vascular HI =	0.01

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Undergound Sewer Lines	Arsenic	5.3E-07	N/A	2.6E-07	7.9E-07	Arsenic	Skin/vascular	0.003	N/A	0.002	0.005
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.02	N/A	0.01	0.03
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.007	N/A	0.003	0.01
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.3	N/A	0.04	0.3
			(Total)	5.3E-07	NA	2.6E-07	7.9E-07	(Total)		0.3	N/A	0.05	0.3
			Total Risk Across Sediment				7.9E-07	Total Hazard Index Across Sediment					0.3
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A	Aluminum	CNS	0.01	N/A	0.0008	0.01
			Arsenic	7.5E-06	N/A	4.3E-06	1.2E-05	Arsenic	Skin/vascular	0.05	N/A	0.003	0.05
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.006	N/A	0.01	0.02
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.08	N/A	0.008	0.08
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.003	N/A	0.0002	0.003
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.2	N/A	0.003	0.2
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.01	N/A	0.0002	0.01
			(Total)	7.5E-06	N/A	4.3E-06	1.2E-05	(Total)		0.3	NA	0.03	0.3
			Total Risk Across Subsurface Soil				1.2E-05	Total Hazard Index Across Subsurface Soil					0.3
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.2	N/A	0.2
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.2	N/A	0.2
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.2
			Total Risk Across All Media and All Exposure Routes				1.3E-05	Total Hazard Index Across All Media and All Exposure Routes					0.9

Total Skin HI =	0.07
Total Gastrointestinal HI =	0.11
Total CNS HI =	0.26
Total Immune System HI =	0.4
Total NOAEL HI =	0.02
Total Vascular HI =	0.07

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A	Aluminum	Skin/vascular	0.05	N/A	0.005	0.06
			Arsenic	1.4E-06	N/A	1.3E-07	1.6E-06	Arsenic	Skin	0.2	N/A	0.02	0.2
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.004	N/A	0.01	0.01
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.4	N/A	0.05	0.4
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.01	N/A	0.001	0.02
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.7	N/A	0.02	0.8
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.05	N/A	0.001	0.05
			(Total)	1.4E-06	N/A	1.3E-07	1.6E-06	(Total)		1	NA	0.1	1.5
			Total Risk Across Subsurface Soil				1.6E-06	Total Hazard Index Across Subsurface Soil					1.5
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.7	N/A	0.7
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.7	N/A	0.7
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.7
Total Risk Across All Media and All Exposure Routes							1.6E-06	Total Hazard Index Across All Media and All Exposure Routes					2.3

Total Skin HI =	0.3
Total Gastrointestinal HI =	0.4
Total CNS HI =	0.8
Total Immune System HI =	0.8
Total NOAEL HI =	0.01
Total Vascular HI =	0.1

TABLE 9.5 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil						Aluminum	CNS	0.01	N/A	0.006	0.02
								Arsenic	Skin/vascular	0.07	N/A	0.03	0.09
								Chromium	NOAEL	0.008	N/A	0.09	0.1
								Iron	Gastrointestinal	0.1	N/A	0.06	0.2
								Manganese	CNS	0.004	N/A	0.001	0.006
								Mercury	Immune System	0.2	N/A	0.02	0.2
								Thallium	Skin/vascular	0.01	N/A	0.002	0.02
			(Total)					(Total)		0.4	NA	0.2	0.6
			Total Risk Across Subsurface Soil				0E+00	Total Hazard Index Across Subsurface Soil					0.6
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.99	N/A	0.99
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.99	N/A	0.99
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.99
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					1.6

Total Skin HI =	0.1
Total Gastrointestinal HI =	0.2
Total CNS HI =	1.0
Total Immune System HI =	0.2
Total NOAEL HI =	0.1
Total Vascular HI =	0.1

TABLE 9.6 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil						Aluminum	CNS	0.1	N/A	0.007	0.1
								Arsenic	Skin/vascular	0.6	N/A	0.03	0.6
								Chromium	NOAEL	0.07	N/A	0.1	0.2
								Iron	Gastrointestinal	1	N/A	0.06	1
								Manganese	CNS	0.04	N/A	0.002	0.04
								Mercury	Immune System	2	N/A	0.03	2
								Thallium	Skin/vascular	0.1	N/A	0.002	0.1
			(Total)					(Total)		4	NA	0.2	4.2
			Total Risk Across Subsurface Soil				0E+00	Total Hazard Index Across Subsurface Soil					4.2
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	2.8	N/A	2.8
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	2.8	N/A	2.8
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					2.8
Total Risk Across All Media and All Exposure Routes							0E+00	Total Hazard Index Across All Media and All Exposure Routes					7.0

Total Skin HI =	0.8
Total Gastrointestinal HI =	1.0
Total CNS HI =	3.0
Total Immune System HI =	2
Total NOAEL HI =	0.2
Total Vascular HI =	0.8

TABLE 9.7 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A						
			Arsenic	3.4E-05	N/A	5.0E-06	3.9E-05						
			Chromium	N/A	N/A	N/A	N/A						
			Iron	N/A	N/A	N/A	N/A						
			Manganese	N/A	N/A	N/A	N/A						
			Mercury	N/A	N/A	N/A	N/A						
			Thallium	N/A	N/A	N/A	N/A						
			(Total)				3.9E-05	(Total)					
			Total Risk Across Subsurface Soil				3.9E-05	Total Hazard Index Across Subsurface Soil					0
Subsurface Soil	Air	Emissions from Subsurface Soil	Mercury	N/A	N/A	N/A	N/A						
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		0.00	0.0	0.00	0.0
			Total Risk Across Emissions from Exposed Subsurface Soil				N/A	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.0
			Total Risk Across All Media and All Exposure Routes				3.9E-05	Total Hazard Index Across All Media and All Exposure Routes					0

TABLE 9.8.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A						
			Arsenic	1.6E-07	N/A	6.5E-08	2.3E-07						
			Chromium	N/A	N/A	N/A	N/A						
			Iron	N/A	N/A	N/A	N/A						
			Manganese	N/A	N/A	N/A	N/A						
			Mercury	N/A	N/A	N/A	N/A						
			Thallium	N/A	N/A	N/A	N/A						
			(Total)	1.6E-07	N/A	6.5E-08	2.3E-07	(Total)					
			Total Risk Across Subsurface Soil				2.3E-07	Total Hazard Index Across Subsurface Soil					0.0
Total Risk Across All Media and All Exposure Routes							2.3E-07	Total Hazard Index Across All Media and All Exposure Routes					0.0

TABLE 9.9.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil						Aluminum	CNS	0.008	N/A	0.001	0.009
								Arsenic	Skin/vascular	0.01	N/A	0.001	0.01
								Chromium	NOAEL	0.0006	N/A	0.02	0.02
								Iron	Gastrointestinal	0.06	N/A	0.01	0.1
								Manganese	CNS	0.002	N/A	0.0002	0.002
								Mercury	Immune System	0.001	N/A	0.00004	0.001
								Thallium	Skin/vascular	0.01	N/A	0.0002	0.007
			(Total)					(Total)		0.09	NA	0.03	0.1
			Total Risk Across Subsurface Soil				0E+00	Total Hazard Index Across Subsurface Soil					0.1
Total Risk Across All Media and All Exposure Routes							0E+00	Total Hazard Index Across All Media and All Exposure Routes					0.1

Total Skin HI =	0.02
Total Gastrointestinal HI =	0.07
Total CNS HI =	0.01
Total Immune System HI =	0.001
Total NOAEL HI =	0.02
Total Vascular HI =	0.018

TABLE 9.10.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil						Aluminum	CNS	0.04	N/A	0.003	0.04
								Arsenic	Skin/vascular	0.05	N/A	0.004	0.05
								Chromium	NOAEL	0.02	N/A	0.05	0.07
								Iron	Gastrointestinal	0.3	N/A	0.03	0.3
								Manganese	CNS	0.01	N/A	0.0007	0.01
								Mercury	Immune System	0.006	N/A	0.0001	0.006
								Thallium	Skin/vascular	0.03	N/A	0.0008	0.03
			(Total)					(Total)		0.4	N/A	0.09	0.5
			Total Risk Across Subsurface Soil				0E+00	Total Hazard Index Across Subsurface Soil					0.5
Subsurface Soil	Air	Emissions from Subsurface Soil						Mercury	CNS	N/A	0.02	N/A	0.02
			(Total)				0.0E+00	(Total)		N/A	0.02	N/A	0.02
			Total Risk Across Emissions from Exposed Subsurface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Subsurface Soil					0.02
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					0.5

TABLE 9.11.CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 15, 16, 49, and 52 - Lab Area Underground Sewer Lines
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	Site Subsurface Soil	Aluminum	N/A	N/A	N/A	N/A						
			Arsenic	2.2E-06	N/A	3.6E-07	2.6E-06						
			Chromium	N/A	N/A	N/A	N/A						
			Iron	N/A	N/A	N/A	N/A						
			Manganese	N/A	N/A	N/A	N/A						
			Mercury	N/A	N/A	N/A	N/A						
			Thallium	N/A	N/A	N/A	N/A						
			(Total)	2.2E-06	N/A	3.6E-07	2.6E-06	(Total)					
			Total Risk Across Subsurface Soil				2.6E-06	Total Hazard Index Across Subsurface Soil					0.0
Total Risk Across All Media and All Exposure Routes							2.6E-06	Total Hazard Index Across All Media and All Exposure Routes					0.0

Appendix I
Human-Health Risk Assessment
RAGS Part D Tables for the
Lab Area Surface Soil and Wetland Area Tables

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Site Surface Soil	Industrial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial workers may be exposed to surface soil during maintenance activities, or daily duties.
						Ingestion	On-site	Quant	Industrial workers may be exposed to surface soil during maintenance activities, or daily duties.
				Trespasser/Visitor	Adult	Dermal Absorption	On-site	Quant	Site access is not restricted. Adults may trespass on site and contact soil.
						Ingestion	On-site	Quant	Site access is not restricted. Adults may trespass on site and contact soil.
					Adolescents	Dermal Absorption	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact soil.
						Ingestion	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and contact soil.
		Air	Emissions from exposed surface soil	Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial workers may inhale dust and volatile emissions from site soils during maintenance activities, or daily duties.
				Trespasser/Visitor	Adult	Inhalation	On-site	Quant	Site access is not restricted. Adults may trespass on site and inhale dust and volatile emissions from soil.
					Adolescents	Inhalation	On-site	Quant	Site access is not restricted. Adolescents may trespass on site and inhale dust and volatile emissions from soil.
	Sediment	Sediment	Site Sediment	Other Recreational Person	Adult	Dermal Absorption	On-site	Quant	Recreational users may contact sediment in the wetland area.
						Ingestion	On-site	Quant	Recreational users may contact sediment in the wetland area.
					Child	Dermal Absorption	On-site	Quant	Recreational users may contact sediment in the wetland area.
						Ingestion	On-site	Quant	Recreational users may contact sediment in the wetland area.
		Fish	Wetland	Other Recreational Person	Adult	Dermal Absorption	On-site	None	Channel size is too small; no fish present.
						Ingestion	On-site	None	Channel size is too small; no fish present.
					Child	Dermal Absorption	On-site	None	Channel size is too small; no fish present.
						Ingestion	On-site	None	Channel size is too small; no fish present.
	Surface Water	Surface Water	Site Surface Water	Other Recreational Person	Adult	Dermal Absorption	On-site	Quant	Recreational users may contact surface water in the wetland area.
						Ingestion	On-site	Quant	Recreational users may contact surface water in the wetland area.
					Child	Dermal Absorption	On-site	Quant	Recreational users may contact surface water in the wetland area.
						Ingestion	On-site	Quant	Recreational users may contact surface water in the wetland area.
Future	Surface Soil	Surface Soil	Site Surface Soil	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Exposure to soil during construction activities.
						Ingestion	On-site	Quant	Exposure to soil during construction activities.
				Resident	Adult	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
					Adult/Child	Dermal Absorption	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
						Ingestion	On-site	Quant	Residents may contact soil, if the site is used for future residential development.
		Air	Emissions from exposed surface soil	Construction Worker	Adult	Inhalation	On-site	Quant	Exposure to emissions from soil during construction activities.
				Resident	Adult	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.
					Adult/Child	Inhalation	On-site	Quant	Residents may inhale vapors and dust from soil, if the site is used for future residential development.

Quant: will be quantitatively evaluated.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	0.0038	J	0.0073	J	MG/KG	IS53SS560001	4/19	0.01 - 0.014	0.0073	N/A	12.3 C	N/A	N/A	NO	BSL
92-52-4	1,1-Biphenyl	0.058	J	0.058	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.058	N/A	391 N	N/A	N/A	NO	BSL
91-57-6	2-Methylnaphthalene	0.14	J	0.14	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.14	N/A	156 N	N/A	N/A	NO	BSL
83-32-9	Acenaphthene	0.11	J	1.2		MG/KG	IS53SS200001	2/20	0.34 - 0.56	1.2	N/A	469 N	N/A	N/A	NO	BSL
208-96-8	Acenaphthylene	0.053	J	0.053	J	MG/KG	IS53SS360001	1/20	0.34 - 0.56	0.053	N/A	156 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	0.046	J	0.26	J	MG/KG	IS53SS140001	4/20	0.34 - 0.56	0.26	N/A	782 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	0.051	J	2.9		MG/KG	IS53SS200001	7/20	0.33 - 0.56	2.9	N/A	2,346 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	0.061	J	0.42	UJ	MG/KG	IS53SS140001 IS53SS20P0001	3/20	0.34 - 0.56	0.42	N/A	782 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.054	J	7.7		MG/KG	IS53SS200001	16/20	0.34 - 4	7.7	N/A	0.875 C	N/A	N/A	YES	ASL
50-32-8	Benzo(a)pyrene	0.046	J	6.3		MG/KG	IS53SS200001	16/20	0.34 - 4	6.3	N/A	0.0875 C	N/A	N/A	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.063	J	9.1		MG/KG	IS53SS200001	16/20	0.34 - 4	9.1	N/A	0.875 C	N/A	N/A	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.041	J	1.7		MG/KG	IS53SS200001	14/20	0.34 - 0.56	1.7	N/A	235 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	0.048	J	2.8		MG/KG	IS53SS200001	13/20	0.34 - 0.56	2.8	N/A	8.75 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.042	J	23		MG/KG	IS53SS010001	10/20	0.34 - 7.9	23	N/A	1,564 N	N/A	N/A	NO	BSL
86-74-8	Carbazole	0.055	J	1.6		MG/KG	IS53SS200001	5/20	0.34 - 0.56	1.6	N/A	31.9 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	0.055	J	7.9	D	MG/KG	IS53SS200001	16/20	0.34 - 4	7.9	N/A	87.5 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.045	J	9.7		MG/KG	IS53SS35P0001	16/20	0.34 - 1.8	9.7	N/A	782 N	N/A	N/A	NO	BSL
117-84-0	Di-n-octylphthalate	0.17	J	0.17	J	MG/KG	IS53SS010001	1/20	0.34 - 0.56	0.17	N/A	160 N	N/A	N/A	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.22	J	0.22	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.22	N/A	0.0875 C	N/A	N/A	YES	ASL
132-64-9	Dibenzofuran	0.1	J	0.6		MG/KG	IS53SS200001	2/20	0.34 - 0.56	0.6	N/A	31.3 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.043	J	0.21	J	MG/KG	IS53SS35P0001	6/20	0.34 - 0.56	0.21	N/A	6,257 N	N/A	N/A	NO	BSL
131-11-3	Dimethyl phthalate	0.04	J	0.45	J	MG/KG	IS53SS140001	3/20	0.34 - 0.56	0.45	N/A	78,214 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	0.064	J	17		MG/KG	IS53SS200001	17/20	0.34 - 4	17	N/A	313 N	N/A	N/A	NO	BSL
86-73-7	Fluorene	0.16	J	1.1		MG/KG	IS53SS200001	2/20	0.34 - 0.56	1.1	N/A	313 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.041	J	1.9		MG/KG	IS53SS200001	15/20	0.34 - 0.56	1.9	N/A	0.875 C	N/A	N/A	YES	ASL
91-20-3	Naphthalene	0.07	J	0.35	UJ	MG/KG	IS53SS200001 IS53SS560001	2/20	0.34 - 0.56	0.35	N/A	156 N	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	0.057	J	13		MG/KG	IS53SS200001	16/20	0.33 - 4	13	N/A	235 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.064	J	14		MG/KG	IS53SS200001	17/20	0.34 - 4	14	N/A	235 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.037	J	1.9		MG/KG	IS53SS010001	15/20	0.34 - 0.56	1.9	N/A	45.6 C	N/A	N/A	NO	BSL
121-14-2	2,4-Dinitrotoluene	0.13	J	7.3	J	MG/KG	IS53SS010001	4/84	0.34 - 0.84	7.3	N/A	15.6 N	N/A	N/A	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	2.14	J	2.14	J	MG/KG	IS53SS060001	1/84	0.48 - 0.84	2.135	N/A	0.47 N	N/A	N/A	YES	ASL
2691-41-0	HMX	268	J	268	J	MG/KG	IS53SS330001	1/84	0.48 - 57	268.364	N/A	391 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	2.6		75		MG/KG	IS53SD18	23/83	1.5 - 4.3	75	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	716		12,000		MG/KG	IS53SS270001	84/84	1.6 - 3	12000	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	0.73	J	17.8		MG/KG	IS53SS280001	33/84	0.62 - 1	17.8	N/A	3.13 N	N/A	N/A	YES	ASL
7440-38-2	Arsenic	1.2	J	66.1		MG/KG	IS53SS26P0001	84/84	0.5 - 1	66.1	N/A	0.426 C	N/A	N/A	YES	ASL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-39-3	Barium	5.8	J	799		MG/KG	IS53SS570001	84/84	0.06 - 0.1	799	N/A	548 N	N/A	N/A	YES	ASL
7440-41-7	Beryllium	0.1	J	0.63	J	MG/KG	IS53SS320001	66/84	0.02 - 0.34	0.63	N/A	15.6 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	0.1	J	31.2		MG/KG	IS53SS26P0001	65/84	0.08 - 0.14	31.2	N/A	3.91 N	N/A	N/A	YES	ASL
7440-70-2	Calcium	100	J	99,000		MG/KG	IS49SS020001	84/84	0.62 - 1	99000	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	3.5		124		MG/KG	IS53SS26P0001	84/84	0.16 - 0.27	124	N/A	23.5 N	N/A	N/A	YES	ASL
7440-48-4	Cobalt	0.92	J	18.9		MG/KG	IS53SS750001	84/84	0.2 - 0.34	18.9	N/A	160 N	N/A	N/A	NO	BSL
7440-50-8	Copper	3.4	J	4,000		MG/KG	IS53SS460001	84/84	0.16 - 0.27	4000	N/A	313 N	N/A	N/A	YES	ASL
57-12-5	Cyanide	0.64		1.4		MG/KG	IS53SS260001	3/84	0.5 - 0.85	1.4	N/A	156 N	N/A	N/A	NO	BSL
7439-89-6	Iron	2,080		32,600		MG/KG	IS53SS26P0001	84/84	2.9 - 5	32600	N/A	2,346 N	N/A	N/A	YES	ASL
7439-92-1	Lead	4.5		31,200		MG/KG	IS53SS26P0001	84/84	0.5 - 1	31200	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	116	J	9,300		MG/KG	IS53SS420001	84/84	1.6 - 3	9300	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	18.3		713		MG/KG	IS53SS74P0001	84/84	0.04 - 0.07	713	N/A	156 N	N/A	N/A	YES	ASL
7439-97-6	Mercury	0.12		962		MG/KG	IS53SD18	78/83	0.04 - 32	962	N/A	2.35 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	1.7	J	76.7		MG/KG	IS49SS010001	84/84	0.34 - 1	76.7	N/A	156 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	105	J	927	J	MG/KG	IS53SS510001	84/84	6 - 11	927	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	0.83	J	1.3	J	MG/KG	IS53SS110001	14/84	0.64 - 1	1.3	N/A	39.1 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.3	J	19.6		MG/KG	IS53SS340001	62/84	0.26 - 0.44	19.6	N/A	39.1 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	60.7	J	1,470		MG/KG	IS53SS26P0001	36/84	53.8 - 90.2	1470	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	0.87	J	2.5	J	MG/KG	IS53SD17	17/84	0.78 - 1.1	2.5	N/A	0.548 N	N/A	N/A	YES	ASL
7440-62-2	Vanadium	10.9	J	39.8		MG/KG	IS53SS780001	83/84	7 - 12	39.8	N/A	54.8 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	17.1		6,000		MG/KG	IS53SS26P0001	84/84	0.01 - 0.14	6000	N/A	2,346 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
RBC value for Chromium VI used for total chromium.
RBC value for napthalene used as surrogate for acenapthalene.
RBC value for pyrene used as surrogate for benzo(g,h,I)perylene and phenanthrene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	1.1E-06	J	2.2E-06	J	mg/m^3	IS53SS560001	4/19	0.01 - 0.014	2.2E-06	N/A	6.3E-04 C	N/A	N/A	NO	BSL
92-52-4	1,1-Biphenyl	4.4E-11	J	4.4E-11	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	4.4E-11	N/A	1.8E-02 N	N/A	N/A	NO	BSL
91-57-6	2-Methylnaphthalene	1.9E-06	J	1.9E-06	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	1.9E-06	N/A	7.3E-03 N	N/A	N/A	NO	BSL
83-32-9	Acenaphthene	3.9E-07	J	4.2E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	4.2E-06	N/A	2.2E-02 N	N/A	N/A	NO	BSL
208-96-8	Acenaphthylene	4.0E-11	J	4.0E-11	J	mg/m^3	IS53SS360001	1/20	0.34 - 0.56	4.0E-11	N/A	3.3E-04 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	3.5E-11	J	2.0E-10	J	mg/m^3	IS53SS140001	4/20	0.34 - 0.56	2.0E-10	N/A	2.1E-06 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	5.0E-08	J	2.9E-06		mg/m^3	IS53SS200001	7/20	0.33 - 0.56	2.9E-06	N/A	1.1E-01 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	4.6E-11	J	3.2E-10	UJ	mg/m^3	IS53SS140001 IS53SS20P0001	3/20	0.34 - 0.56	3.2E-10	N/A	3.7E-02 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	4.1E-11	J	5.8E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	5.8E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	3.5E-11	J	4.8E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	4.8E-09	N/A	2.0E-06 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	4.8E-11	J	6.9E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	6.9E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
191-24-2	Benzo(g,h,i)perylene	3.1E-11	J	1.3E-09		mg/m^3	IS53SS200001	14/20	0.34 - 0.56	1.3E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	3.6E-11	J	2.1E-09		mg/m^3	IS53SS200001	13/20	0.34 - 0.56	2.1E-09	N/A	8.6E-05 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	3.9E-09	J	2.1E-06		mg/m^3	IS53SS010001	10/20	0.34 - 7.9	2.1E-06	N/A	7.3E-02 N	N/A	N/A	NO	BSL
86-74-8	Carbazole	4.2E-11	J	1.2E-09		mg/m^3	IS53SS200001	5/20	0.34 - 0.56	1.2E-09	N/A	3.1E-04 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	4.2E-11	J	6.0E-09	D	mg/m^3	IS53SS200001	16/20	0.34 - 4	6.0E-09	N/A	8.6E-04 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	4.3E-09	J	9.3E-07		mg/m^3	IS53SS35P0001	16/20	0.34 - 1.8	9.3E-07	N/A	3.7E-02 N	N/A	N/A	NO	BSL
117-84-0	Di-n-octylphthalate	1.3E-10	J	1.3E-10	J	mg/m^3	IS53SS010001	1/20	0.34 - 0.56	1.3E-10	N/A	N/A N	N/A	N/A	NO	NTX
53-70-3	Dibenz(a,h)anthracene	1.7E-10	J	1.7E-10	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	1.7E-10	N/A	8.6E-07 C	N/A	N/A	NO	BSL
132-64-9	Dibenzofuran	3.8E-07	J	2.3E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	2.3E-06	N/A	1.5E-03 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	5.0E-08	J	2.4E-07	J	mg/m^3	IS53SS35P0001	6/20	0.34 - 0.56	2.4E-07	N/A	2.9E-01 N	N/A	N/A	NO	BSL
131-11-3	Dimethyl phthalate	3.0E-11	J	3.4E-10	J	mg/m^3	IS53SS140001	3/20	0.34 - 0.56	3.4E-10	N/A	3.7E+00 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	4.8E-11	J	1.3E-08		mg/m^3	IS53SS200001	17/20	0.34 - 4	1.3E-08	N/A	1.5E-02 N	N/A	N/A	NO	BSL
86-73-7	Fluorene	2.4E-07	J	1.7E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	1.7E-06	N/A	1.5E-02 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.1E-11	J	1.4E-09		mg/m^3	IS53SS200001	15/20	0.34 - 0.56	1.4E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
91-20-3	Naphthalene	9.7E-07	J	4.8E-06	UJ	mg/m^3	IS53SS200001 IS53SS560001	2/20	0.34 - 0.56	4.8E-06	N/A	3.3E-04 N	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	4.3E-11	J	9.8E-09		mg/m^3	IS53SS200001	16/20	0.33 - 4	9.8E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	1.3E-08	J	2.8E-06		mg/m^3	IS53SS200001	17/20	0.34 - 4	2.8E-06	N/A	1.1E-02 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.6E-10	J	8.2E-09		mg/m^3	IS53SS010001	15/20	0.34 - 0.56	8.2E-09	N/A	4.5E-04 C	N/A	N/A	NO	BSL
121-14-2	2,4-Dinitrotoluene	9.8E-11	J	5.5E-09	J	mg/m^3	IS53SS010001	4/84	0.34 - 0.84	5.5E-09	N/A	7.3E-04 N	N/A	N/A	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	1.6E-09	J	1.6E-09	J	mg/m^3	IS53SS060001	1/84	0.48 - 0.84	1.6E-09	N/A	2.2E-04 N	N/A	N/A	NO	BSL
2691-41-0	HMX	2.0E-07	J	2.0E-07	J	mg/m^3	IS53SS330001	1/84	0.48 - 57	2.0E-07	N/A	1.8E-02 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	2.0E-09		5.7E-08		mg/m^3	IS53SD18	23/83	1.5 - 4.3	5.7E-08	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	5.4E-07		9.1E-06		mg/m^3	IS53SS270001	84/84	1.6 - 3	9.1E-06	N/A	3.7E-04 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	5.5E-10	J	1.3E-08		mg/m^3	IS53SS280001	33/84	0.62 - 1	1.3E-08	N/A	1.5E-04 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	9.1E-10	J	5.0E-08		mg/m^3	IS53SS26P0001	84/84	0.5 - 1	5.0E-08	N/A	4.1E-07 C	N/A	N/A	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-39-3	Barium	4.4E-09	J	6.1E-07		mg/m^3	IS53SS570001	84/84	0.06 - 0.1	6.1E-07	N/A	5.1E-05 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	7.6E-11	J	4.8E-10	J	mg/m^3	IS53SS320001	66/84	0.02 - 0.34	4.8E-10	N/A	7.5E-07 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	7.6E-11	J	2.4E-08		mg/m^3	IS53SS26P0001	65/84	0.08 - 0.14	2.4E-08	N/A	9.9E-07 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	7.6E-08	J	7.5E-05		mg/m^3	IS49SS020001	84/84	0.62 - 1	7.5E-05	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	2.7E-09		9.4E-08		mg/m^3	IS53SS26P0001	84/84	0.16 - 0.27	9.4E-08	N/A	1.5E-07 C	N/A	N/A	NO	BSL
7440-48-4	Cobalt	7.0E-10	J	1.4E-08		mg/m^3	IS53SS750001	84/84	0.2 - 0.34	1.4E-08	N/A	2.1E-06 N	N/A	N/A	NO	BSL
7440-50-8	Copper	2.6E-09	J	3.0E-06		mg/m^3	IS53SS460001	84/84	0.16 - 0.27	3.0E-06	N/A	1.5E-02 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	4.8E-10		1.1E-09		mg/m^3	IS53SS260001	3/84	0.5 - 0.85	1.1E-09	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7439-89-6	Iron	1.6E-06		2.5E-05		mg/m^3	IS53SS26P0001	84/84	2.9 - 5	2.5E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7439-92-1	Lead	3.4E-09		2.4E-05		mg/m^3	IS53SS26P0001	84/84	0.5 - 1	2.4E-05	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	8.8E-08	J	7.0E-06		mg/m^3	IS53SS420001	84/84	1.6 - 3	7.0E-06	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	1.4E-08		5.4E-07		mg/m^3	IS53SS74P0001	84/84	0.04 - 0.07	5.4E-07	N/A	5.2E-06 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	2.8E-06		2.2E-02		mg/m^3	IS53SD18	78/83	0.04 - 32	2.2E-02	N/A	3.1E-05 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	1.3E-09	J	5.8E-08		mg/m^3	IS49SS010001	84/84	0.34 - 1	5.8E-08	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	8.0E-08	J	7.0E-07	J	mg/m^3	IS53SS510001	84/84	6 - 11	7.0E-07	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	6.3E-10	J	9.8E-10	J	mg/m^3	IS53SS110001	14/84	0.64 - 1	9.8E-10	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-22-4	Silver	2.3E-10	J	1.5E-08		mg/m^3	IS53SS340001	62/84	0.26 - 0.44	1.5E-08	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	4.6E-08	J	1.1E-06		mg/m^3	IS53SS26P0001	36/84	53.8 - 90.2	1.1E-06	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	6.6E-10	J	1.9E-09	J	mg/m^3	IS53SD17	17/84	0.78 - 1.1	1.9E-09	N/A	2.6E-05 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	8.3E-09	J	3.0E-08		mg/m^3	IS53SS780001	83/84	7 - 12	3.0E-08	N/A	2.6E-03 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	1.3E-08		4.5E-06		mg/m^3	IS53SS26P0001	84/84	0.01 - 0.14	4.5E-06	N/A	1.1E-01 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for napthalene used as surrogate for acenapthalene.
RBC value for pyrene used as surrogate for phenanthrene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Lab Area, Naval District Washington, Indian Head

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	1.50E+02	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Butylbenzylphthalate	1.74E-02	5.17E-05	4.83E-06	5.75E+04	3.45E+02	2.69E+00	
Di-n-butylphthalate	4.38E-02	3.85E-08	7.86E-06	3.39E+04	2.03E+02	1.12E+01	
Dibenzofuran	6.19E-02	3.98E-03		5.48E+03	3.29E+01	5.65E+00	
Diethylphthalate	2.56E-02	1.85E-05	6.35E-06	2.88E+02	1.73E+00	1.08E+03	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	
Mercury	3.07E-02	4.67E-01	6.30E-06		5.20E01		

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
84-74-2	Di-n-butylphthalate	0.14	J	0.14	J	MG/KG	IS53SD14	1/1	0.83 - 0.83	0.14	N/A	7,821 N	N/A	N/A	NO	BSL
7429-90-5	Aluminum	4,730		9,660		MG/KG	IS53SD14P	2/2	2 - 4	9660	N/A	78,214 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	3.9		20.2		MG/KG	IS53SD14P	2/2	1 - 1	20.2	N/A	4.26 C	N/A	N/A	YES	ASL
7440-39-3	Barium	53	J	138		MG/KG	IS53SD14	2/2	0.09 - 0.15	138	N/A	5,475 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	0.36	J	0.71	J	MG/KG	IS53SD14	2/2	0.29 - 0.51	0.71	N/A	156 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	0.25	J	1.1	J	MG/KG	IS53SD14	2/2	0.11 - 0.2	1.1	N/A	39.1 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	1,770		2,280	J	MG/KG	IS53SD14	2/2	1 - 2	2280	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	10.1		16.4		MG/KG	IS53SD14	2/2	0.23 - 0.4	16.4	N/A	235 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	10.9	J	28		MG/KG	IS53SD14P	2/2	0.29 - 1	28	N/A	1,600 N	N/A	N/A	NO	BSL
7440-50-8	Copper	12		28.2		MG/KG	IS53SD14	2/2	0.23 - 0.4	28.2	N/A	3,129 N	N/A	N/A	NO	BSL
7439-89-6	Iron	9,090		17,000		MG/KG	IS53SD14	2/2	4 - 7	17000	N/A	23,464 N	N/A	N/A	NO	BSL
7439-92-1	Lead	32.3		82.8		MG/KG	IS53SD14	2/2	1 - 1	82.8	N/A	400	N/A	N/A	NO	BSL
7439-95-4	Magnesium	810	J	1,150	J	MG/KG	IS53SD14	2/2	2 - 4	1150	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	488		1,070		MG/KG	IS53SD14	2/2	0.06 - 0.1	1070	N/A	1,564 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	18.6		24.5		MG/KG	IS53SD14	2/2	1 - 2	24.5	N/A	23.5 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	6.3	J	17.8	J	MG/KG	IS53SD14	2/2	0.49 - 1	17.8	N/A	1,564 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	294	J	425	J	MG/KG	IS53SD14	2/2	9 - 16	425	N/A	N/A	N/A	N/A	NO	NUT
7440-22-4	Silver	0.44	J	2.2	J	MG/KG	IS53SD14	2/2	0.37 - 1	2.2	N/A	391 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	303	J	303	J	MG/KG	IS53SD14	1/2	76 - 140	303	N/A	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	24.4		65.9		MG/KG	IS53SD14	2/2	10 - 18	65.9	N/A	548 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	83		189		MG/KG	IS53SD14	2/2	0.01 - 0.03	189	N/A	23,464 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7429-90-5	Aluminum	514	J	514	J	UG/L	IS53SW01	1/1	7.9 - 7.9	514	N/A	36,500 N			NO	BSL
7440-38-2	Arsenic	47		47		UG/L	IS53SW01	1/1	2.5 - 2.5	47	N/A	0.446 C			YES	ASL
7440-39-3	Barium	10.1	J	10.1	J	UG/L	IS53SW01	1/1	0.3 - 0.3	10.1	N/A	2,555 N			NO	BSL
7440-41-7	Beryllium	0.11	J	0.11	J	UG/L	IS53SW01P	1/1	0.1 - 0.1	0.11	N/A	73 N			NO	BSL
7440-43-9	Cadmium	0.82	J	0.82	J	UG/L	IS53SW01	1/1	0.4 - 0.4	0.82	N/A	18.3 N			NO	BSL
7440-70-2	Calcium	2,680	J	2,680	J	UG/L	IS53SW01	1/1	3.1 - 3.1	2680	N/A	N/A			NO	NUT
7440-48-4	Cobalt	3.1	J	3.1	J	UG/L	IS53SW01	1/1	1 - 1	3.1	N/A	730 N			NO	BSL
7440-50-8	Copper	3.4	J	3.4	J	UG/L	IS53SW01P	1/1	0.8 - 0.8	3.4	N/A	1,460 N			NO	BSL
7439-89-6	Iron	2,760		2,760		UG/L	IS53SW01	1/1	15 - 15	2760	N/A	10,950 N			NO	BSL
7439-92-1	Lead	5.2		5.2		UG/L	IS53SW01P	1/1	2.5 - 2.5	5.2	N/A	15			NO	BSL
7439-95-4	Magnesium	846	J	846	J	UG/L	IS53SW01	1/1	7.9 - 7.9	846	N/A	N/A			NO	NUT
7439-96-5	Manganese	1,300		1,300		UG/L	IS53SW01	1/1	0.2 - 0.2	1300	N/A	730 N			YES	ASL
7439-97-6	Mercury	1	L	1	L	UG/L	IS53SW01P	1/1	0.2 - 0.2	1	N/A	11.0 N			NO	BSL
7440-09-7	Potassium	2,590	J	2,590	J	UG/L	IS53SW01	1/1	31 - 31	2590	N/A	N/A			NO	NUT
7782-49-2	Selenium	4.9	J	4.9	J	UG/L	IS53SW01	1/1	3.2 - 3.2	4.9	N/A	183 N			NO	BSL
7440-23-5	Sodium	95,100	J	95,100	J	UG/L	IS53SW01	1/1	270 - 270	95100	N/A	N/A			NO	NUT
7440-66-6	Zinc	28.2		28.2		UG/L	IS53SW01	1/1	0.5 - 0.5	28.2	N/A	10,950 N			NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
RBC value for Chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	0.0038	J	0.0073	J	MG/KG	IS53SS560001	4/19	0.01 - 0.014	0.0073	N/A	12.3 C	N/A	N/A	NO	BSL
92-52-4	1,1-Biphenyl	0.058	J	0.058	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.058	N/A	391 N	N/A	N/A	NO	BSL
91-57-6	2-Methylnaphthalene	0.14	J	0.14	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.14	N/A	156 N	N/A	N/A	NO	BSL
83-32-9	Acenaphthene	0.11	J	1.2		MG/KG	IS53SS200001	2/20	0.34 - 0.56	1.2	N/A	469 N	N/A	N/A	NO	BSL
208-96-8	Acenaphthylene	0.053	J	0.053	J	MG/KG	IS53SS360001	1/20	0.34 - 0.56	0.053	N/A	156 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	0.046	J	0.26	J	MG/KG	IS53SS140001	4/20	0.34 - 0.56	0.26	N/A	782 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	0.051	J	2.9		MG/KG	IS53SS200001	7/20	0.33 - 0.56	2.9	N/A	2,346 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	0.061	J	0.42	UJ	MG/KG	IS53SS140001 IS53SS20P0001	3/20	0.34 - 0.56	0.42	N/A	782 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	0.054	J	7.7		MG/KG	IS53SS200001	16/20	0.34 - 4	7.7	N/A	0.875 C	N/A	N/A	YES	ASL
50-32-8	Benzo(a)pyrene	0.046	J	6.3		MG/KG	IS53SS200001	16/20	0.34 - 4	6.3	N/A	0.0875 C	N/A	N/A	YES	ASL
205-99-2	Benzo(b)fluoranthene	0.063	J	9.1		MG/KG	IS53SS200001	16/20	0.34 - 4	9.1	N/A	0.875 C	N/A	N/A	YES	ASL
191-24-2	Benzo(g,h,i)perylene	0.041	J	1.7		MG/KG	IS53SS200001	14/20	0.34 - 0.56	1.7	N/A	235 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	0.048	J	2.8		MG/KG	IS53SS200001	13/20	0.34 - 0.56	2.8	N/A	8.75 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	0.042	J	23		MG/KG	IS53SS010001	10/20	0.34 - 7.9	23	N/A	1,564 N	N/A	N/A	NO	BSL
86-74-8	Carbazole	0.055	J	1.6		MG/KG	IS53SS200001	5/20	0.34 - 0.56	1.6	N/A	31.9 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	0.055	J	7.9	D	MG/KG	IS53SS200001	16/20	0.34 - 4	7.9	N/A	87.5 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	0.045	J	9.7		MG/KG	IS53SS35P0001	16/20	0.34 - 1.8	9.7	N/A	782 N	N/A	N/A	NO	BSL
117-84-0	Di-n-octylphthalate	0.17	J	0.17	J	MG/KG	IS53SS010001	1/20	0.34 - 0.56	0.17	N/A	160 N	N/A	N/A	NO	BSL
53-70-3	Dibenz(a,h)anthracene	0.22	J	0.22	J	MG/KG	IS53SS200001	1/20	0.34 - 0.56	0.22	N/A	0.0875 C	N/A	N/A	YES	ASL
132-64-9	Dibenzofuran	0.1	J	0.6		MG/KG	IS53SS200001	2/20	0.34 - 0.56	0.6	N/A	31.3 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	0.043	J	0.21	J	MG/KG	IS53SS35P0001	6/20	0.34 - 0.56	0.21	N/A	6,257 N	N/A	N/A	NO	BSL
131-11-3	Dimethyl phthalate	0.04	J	0.45	J	MG/KG	IS53SS140001	3/20	0.34 - 0.56	0.45	N/A	78,214 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	0.064	J	17		MG/KG	IS53SS200001	17/20	0.34 - 4	17	N/A	313 N	N/A	N/A	NO	BSL
86-73-7	Fluorene	0.16	J	1.1		MG/KG	IS53SS200001	2/20	0.34 - 0.56	1.1	N/A	313 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0.041	J	1.9		MG/KG	IS53SS200001	15/20	0.34 - 0.56	1.9	N/A	0.875 C	N/A	N/A	YES	ASL
91-20-3	Naphthalene	0.07	J	0.35	UJ	MG/KG	IS53SS200001 IS53SS560001	2/20	0.34 - 0.56	0.35	N/A	156 N	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	0.057	J	13		MG/KG	IS53SS200001	16/20	0.33 - 4	13	N/A	235 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	0.064	J	14		MG/KG	IS53SS200001	17/20	0.34 - 4	14	N/A	235 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	0.037	J	1.9		MG/KG	IS53SS010001	15/20	0.34 - 0.56	1.9	N/A	45.6 C	N/A	N/A	NO	BSL
121-14-2	2,4-Dinitrotoluene	0.13	J	7.3	J	MG/KG	IS53SS010001	4/84	0.34 - 0.84	7.3	N/A	15.6 N	N/A	N/A	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	2.14	J	2.14	J	MG/KG	IS53SS060001	1/84	0.48 - 0.84	2.135	N/A	0.47 N	N/A	N/A	YES	ASL
2691-41-0	HMX	268	J	268	J	MG/KG	IS53SS330001	1/84	0.48 - 57	268.364	N/A	391 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	2.6		75		MG/KG	IS53SD18	23/83	1.5 - 4.3	75	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	716		12,000		MG/KG	IS53SS270001	84/84	1.6 - 3	12000	N/A	7,821 N	N/A	N/A	YES	ASL
7440-36-0	Antimony	0.73	J	17.8		MG/KG	IS53SS280001	33/84	0.62 - 1	17.8	N/A	3.13 N	N/A	N/A	YES	ASL
7440-38-2	Arsenic	1.2	J	66.1		MG/KG	IS53SS26P0001	84/84	0.5 - 1	66.1	N/A	0.426 C	N/A	N/A	YES	ASL

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-39-3	Barium	5.8	J	799		MG/KG	IS53SS570001	84/84	0.06 - 0.1	799	N/A	548 N	N/A	N/A	YES	ASL
7440-41-7	Beryllium	0.1	J	0.63	J	MG/KG	IS53SS320001	66/84	0.02 - 0.34	0.63	N/A	15.6 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	0.1	J	31.2		MG/KG	IS53SS26P0001	65/84	0.08 - 0.14	31.2	N/A	3.91 N	N/A	N/A	YES	ASL
7440-70-2	Calcium	100	J	99,000		MG/KG	IS49SS020001	84/84	0.62 - 1	99000	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	3.5		124		MG/KG	IS53SS26P0001	84/84	0.16 - 0.27	124	N/A	23.5 N	N/A	N/A	YES	ASL
7440-48-4	Cobalt	0.92	J	18.9		MG/KG	IS53SS750001	84/84	0.2 - 0.34	18.9	N/A	160 N	N/A	N/A	NO	BSL
7440-50-8	Copper	3.4	J	4,000		MG/KG	IS53SS460001	84/84	0.16 - 0.27	4000	N/A	313 N	N/A	N/A	YES	ASL
57-12-5	Cyanide	0.64		1.4		MG/KG	IS53SS260001	3/84	0.5 - 0.85	1.4	N/A	156 N	N/A	N/A	NO	BSL
7439-89-6	Iron	2,080		32,600		MG/KG	IS53SS26P0001	84/84	2.9 - 5	32600	N/A	2,346 N	N/A	N/A	YES	ASL
7439-92-1	Lead	4.5		31,200		MG/KG	IS53SS26P0001	84/84	0.5 - 1	31200	N/A	400	N/A	N/A	YES	ASL
7439-95-4	Magnesium	116	J	9,300		MG/KG	IS53SS420001	84/84	1.6 - 3	9300	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	18.3		713		MG/KG	IS53SS74P0001	84/84	0.04 - 0.07	713	N/A	156 N	N/A	N/A	YES	ASL
7439-97-6	Mercury	0.12		962		MG/KG	IS53SD18	78/83	0.04 - 32	962	N/A	2.35 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	1.7	J	76.7		MG/KG	IS49SS010001	84/84	0.34 - 1	76.7	N/A	156 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	105	J	927	J	MG/KG	IS53SS510001	84/84	6 - 11	927	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	0.83	J	1.3	J	MG/KG	IS53SS110001	14/84	0.64 - 1	1.3	N/A	39.1 N	N/A	N/A	NO	BSL
7440-22-4	Silver	0.3	J	19.6		MG/KG	IS53SS340001	62/84	0.26 - 0.44	19.6	N/A	39.1 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	60.7	J	1,470		MG/KG	IS53SS26P0001	36/84	53.8 - 90.2	1470	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	0.87	J	2.5	J	MG/KG	IS53SD17	17/84	0.78 - 1.1	2.5	N/A	0.548 N	N/A	N/A	YES	ASL
7440-62-2	Vanadium	10.9	J	39.8		MG/KG	IS53SS780001	83/84	7 - 12	39.8	N/A	54.8 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	17.1		6,000		MG/KG	IS53SS26P0001	84/84	0.01 - 0.14	6000	N/A	2,346 N	N/A	N/A	YES	ASL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
RBC value for Chromium VI used for total chromium.
RBC value for napthalene used as surrogate for acenapthalene.
RBC value for pyrene used as surrogate for benzo(g,h,I)perylene and phenanthrene.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
127-18-4	Tetrachloroethene	1.1E-06	J	2.2E-06	J	mg/m^3	IS53SS560001	4/19	0.01 - 0.014	2.2E-06	N/A	6.3E-04 C	N/A	N/A	NO	BSL
92-52-4	1,1-Biphenyl	4.4E-11	J	4.4E-11	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	4.4E-11	N/A	1.8E-02 N	N/A	N/A	NO	BSL
91-57-6	2-Methylnaphthalene	1.9E-06	J	1.9E-06	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	1.9E-06	N/A	7.3E-03 N	N/A	N/A	NO	BSL
83-32-9	Acenaphthene	3.9E-07	J	4.2E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	4.2E-06	N/A	2.2E-02 N	N/A	N/A	NO	BSL
208-96-8	Acenaphthylene	4.0E-11	J	4.0E-11	J	mg/m^3	IS53SS360001	1/20	0.34 - 0.56	4.0E-11	N/A	3.3E-04 N	N/A	N/A	NO	BSL
98-86-2	Acetophenone	3.5E-11	J	2.0E-10	J	mg/m^3	IS53SS140001	4/20	0.34 - 0.56	2.0E-10	N/A	2.1E-06 N	N/A	N/A	NO	BSL
120-12-7	Anthracene	5.0E-08	J	2.9E-06		mg/m^3	IS53SS200001	7/20	0.33 - 0.56	2.9E-06	N/A	1.1E-01 N	N/A	N/A	NO	BSL
100-52-7	Benzaldehyde	4.6E-11	J	3.2E-10	UJ	mg/m^3	IS53SS140001 IS53SS20P0001	3/20	0.34 - 0.56	3.2E-10	N/A	3.7E-02 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	4.1E-11	J	5.8E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	5.8E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	3.5E-11	J	4.8E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	4.8E-09	N/A	2.0E-06 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	4.8E-11	J	6.9E-09		mg/m^3	IS53SS200001	16/20	0.34 - 4	6.9E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
191-24-2	Benzo(g,h,i)perylene	3.1E-11	J	1.3E-09		mg/m^3	IS53SS200001	14/20	0.34 - 0.56	1.3E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	3.6E-11	J	2.1E-09		mg/m^3	IS53SS200001	13/20	0.34 - 0.56	2.1E-09	N/A	8.6E-05 C	N/A	N/A	NO	BSL
85-68-7	Butylbenzylphthalate	3.9E-09	J	2.1E-06		mg/m^3	IS53SS010001	10/20	0.34 - 7.9	2.1E-06	N/A	7.3E-02 N	N/A	N/A	NO	BSL
86-74-8	Carbazole	4.2E-11	J	1.2E-09		mg/m^3	IS53SS200001	5/20	0.34 - 0.56	1.2E-09	N/A	3.1E-04 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	4.2E-11	J	6.0E-09	D	mg/m^3	IS53SS200001	16/20	0.34 - 4	6.0E-09	N/A	8.6E-04 C	N/A	N/A	NO	BSL
84-74-2	Di-n-butylphthalate	4.3E-09	J	9.3E-07		mg/m^3	IS53SS35P0001	16/20	0.34 - 1.8	9.3E-07	N/A	3.7E-02 N	N/A	N/A	NO	BSL
117-84-0	Di-n-octylphthalate	1.3E-10	J	1.3E-10	J	mg/m^3	IS53SS010001	1/20	0.34 - 0.56	1.3E-10	N/A	N/A N	N/A	N/A	NO	NTX
53-70-3	Dibenz(a,h)anthracene	1.7E-10	J	1.7E-10	J	mg/m^3	IS53SS200001	1/20	0.34 - 0.56	1.7E-10	N/A	8.6E-07 C	N/A	N/A	NO	BSL
132-64-9	Dibenzofuran	3.8E-07	J	2.3E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	2.3E-06	N/A	1.5E-03 N	N/A	N/A	NO	BSL
84-66-2	Diethylphthalate	5.0E-08	J	2.4E-07	J	mg/m^3	IS53SS35P0001	6/20	0.34 - 0.56	2.4E-07	N/A	2.9E-01 N	N/A	N/A	NO	BSL
131-11-3	Dimethyl phthalate	3.0E-11	J	3.4E-10	J	mg/m^3	IS53SS140001	3/20	0.34 - 0.56	3.4E-10	N/A	3.7E+00 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	4.8E-11	J	1.3E-08		mg/m^3	IS53SS200001	17/20	0.34 - 4	1.3E-08	N/A	1.5E-02 N	N/A	N/A	NO	BSL
86-73-7	Fluorene	2.4E-07	J	1.7E-06		mg/m^3	IS53SS200001	2/20	0.34 - 0.56	1.7E-06	N/A	1.5E-02 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.1E-11	J	1.4E-09		mg/m^3	IS53SS200001	15/20	0.34 - 0.56	1.4E-09	N/A	8.6E-06 C	N/A	N/A	NO	BSL
91-20-3	Naphthalene	9.7E-07	J	4.8E-06	UJ	mg/m^3	IS53SS200001 IS53SS560001	2/20	0.34 - 0.56	4.8E-06	N/A	3.3E-04 N	N/A	N/A	NO	BSL
85-01-8	Phenanthrene	4.3E-11	J	9.8E-09		mg/m^3	IS53SS200001	16/20	0.33 - 4	9.8E-09	N/A	1.1E-02 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	1.3E-08	J	2.8E-06		mg/m^3	IS53SS200001	17/20	0.34 - 4	2.8E-06	N/A	1.1E-02 N	N/A	N/A	NO	BSL
117-81-7	bis(2-Ethylhexyl)phthalate	1.6E-10	J	8.2E-09		mg/m^3	IS53SS010001	15/20	0.34 - 0.56	8.2E-09	N/A	4.5E-04 C	N/A	N/A	NO	BSL
121-14-2	2,4-Dinitrotoluene	9.8E-11	J	5.5E-09	J	mg/m^3	IS53SS010001	4/84	0.34 - 0.84	5.5E-09	N/A	7.3E-04 N	N/A	N/A	NO	BSL
35572-78-2	2-Amino-4,6-dinitrotoluene	1.6E-09	J	1.6E-09	J	mg/m^3	IS53SS060001	1/84	0.48 - 0.84	1.6E-09	N/A	2.2E-04 N	N/A	N/A	NO	BSL
2691-41-0	HMX	2.0E-07	J	2.0E-07	J	mg/m^3	IS53SS330001	1/84	0.48 - 57	2.0E-07	N/A	1.8E-02 N	N/A	N/A	NO	BSL
9004-70-0	Nitrocellulose	2.0E-09		5.7E-08		mg/m^3	IS53SD18	23/83	1.5 - 4.3	5.7E-08	N/A	N/A	N/A	N/A	NO	NTX
7429-90-5	Aluminum	5.4E-07		9.1E-06		mg/m^3	IS53SS270001	84/84	1.6 - 3	9.1E-06	N/A	3.7E-04 N	N/A	N/A	NO	BSL
7440-36-0	Antimony	5.5E-10	J	1.3E-08		mg/m^3	IS53SS280001	33/84	0.62 - 1	1.3E-08	N/A	1.5E-04 N	N/A	N/A	NO	BSL
7440-38-2	Arsenic	9.1E-10	J	5.0E-08		mg/m^3	IS53SS26P0001	84/84	0.5 - 1	5.0E-08	N/A	4.1E-07 C	N/A	N/A	NO	BSL

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

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	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
7440-39-3	Barium	4.4E-09	J	6.1E-07		mg/m^3	IS53SS570001	84/84	0.06 - 0.1	6.1E-07	N/A	5.1E-05 N	N/A	N/A	NO	BSL
7440-41-7	Beryllium	7.6E-11	J	4.8E-10	J	mg/m^3	IS53SS320001	66/84	0.02 - 0.34	4.8E-10	N/A	7.5E-07 N	N/A	N/A	NO	BSL
7440-43-9	Cadmium	7.6E-11	J	2.4E-08		mg/m^3	IS53SS26P0001	65/84	0.08 - 0.14	2.4E-08	N/A	9.9E-07 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	7.6E-08	J	7.5E-05		mg/m^3	IS49SS020001	84/84	0.62 - 1	7.5E-05	N/A	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	2.7E-09		9.4E-08		mg/m^3	IS53SS26P0001	84/84	0.16 - 0.27	9.4E-08	N/A	1.5E-07 N	N/A	N/A	NO	BSL
7440-48-4	Cobalt	7.0E-10	J	1.4E-08		mg/m^3	IS53SS750001	84/84	0.2 - 0.34	1.4E-08	N/A	2.1E-06 N	N/A	N/A	NO	BSL
7440-50-8	Copper	2.6E-09	J	3.0E-06		mg/m^3	IS53SS460001	84/84	0.16 - 0.27	3.0E-06	N/A	1.5E-02 N	N/A	N/A	NO	BSL
57-12-5	Cyanide	4.8E-10		1.1E-09		mg/m^3	IS53SS260001	3/84	0.5 - 0.85	1.1E-09	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7439-89-6	Iron	1.6E-06		2.5E-05		mg/m^3	IS53SS26P0001	84/84	2.9 - 5	2.5E-05	N/A	1.1E-01 N	N/A	N/A	NO	BSL
7439-92-1	Lead	3.4E-09		2.4E-05		mg/m^3	IS53SS26P0001	84/84	0.5 - 1	2.4E-05	N/A	N/A	N/A	N/A	NO	NTX
7439-95-4	Magnesium	8.8E-08	J	7.0E-06		mg/m^3	IS53SS420001	84/84	1.6 - 3	7.0E-06	N/A	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	1.4E-08		5.4E-07		mg/m^3	IS53SS74P0001	84/84	0.04 - 0.07	5.4E-07	N/A	5.2E-06 N	N/A	N/A	NO	BSL
7439-97-6	Mercury	2.8E-06		2.2E-02		mg/m^3	IS53SD18	78/83	0.04 - 32	2.2E-02	N/A	3.1E-05 N	N/A	N/A	YES	ASL
7440-02-0	Nickel	1.3E-09	J	5.8E-08		mg/m^3	IS49SS010001	84/84	0.34 - 1	5.8E-08	N/A	7.3E-03 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	8.0E-08	J	7.0E-07	J	mg/m^3	IS53SS510001	84/84	6 - 11	7.0E-07	N/A	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	6.3E-10	J	9.8E-10	J	mg/m^3	IS53SS110001	14/84	0.64 - 1	9.8E-10	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-22-4	Silver	2.3E-10	J	1.5E-08		mg/m^3	IS53SS340001	62/84	0.26 - 0.44	1.5E-08	N/A	1.8E-03 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	4.6E-08	J	1.1E-06		mg/m^3	IS53SS26P0001	36/84	53.8 - 90.2	1.1E-06	N/A	N/A	N/A	N/A	NO	NUT
7440-28-0	Thallium	6.6E-10	J	1.9E-09	J	mg/m^3	IS53SD17	17/84	0.78 - 1.1	1.9E-09	N/A	2.6E-05 N	N/A	N/A	NO	BSL
7440-62-2	Vanadium	8.3E-09	J	3.0E-08		mg/m^3	IS53SS780001	83/84	7 - 12	3.0E-08	N/A	2.6E-03 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	1.3E-08		4.5E-06		mg/m^3	IS53SS26P0001	84/84	0.01 - 0.14	4.5E-06	N/A	1.1E-01 N	N/A	N/A	NO	BSL

[1] Minimum/Maximum detected concentration.
[2] Maximum concentration is used for screening.
[3] Background values not available.
[4] Risk-Based Concentration Table, October 9, 2002, U.S. EPA Region III, Jennifer Hubbard.
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for Chromium VI used for total chromium.
RBC value for napthalene used as surrogate for acenapthalene.
RBC value for pyrene used as surrogate for phenanthrene.
[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6.A
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Calculation of Generic Chemical Specific VF Factors
Lab Area, Naval District Washington, Indian Head

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	
Volatile Organics							
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	1.50E+02	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	
Acetophenone	N/A	4.99E-04	N/A	4.68E+01	2.81E-01	1.66E+03	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	
Butylbenzylphthalate	1.74E-02	5.17E-05	4.83E-06	5.75E+04	3.45E+02	2.69E+00	
Di-n-butylphthalate	4.38E-02	3.85E-08	7.86E-06	3.39E+04	2.03E+02	1.12E+01	
Dibenzofuran	6.19E-02	3.98E-03		5.48E+03	3.29E+01	5.65E+00	
Diethylphthalate	2.56E-02	1.85E-05	6.35E-06	2.88E+02	1.73E+00	1.08E+03	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	
Mercury	3.07E-02	4.67E-01	6.30E-06		5.20E01		

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source for Philadelphia (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Chemical and physical properties from USEPA, 1996, *Soil Screening Guidance: User's Guide,* EPA/540/R-96/018.

Table 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.658	1.31	7.70		MG/KG	0.958	95% UCL-T	W-Test (4)	0.233	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.568	1.10	6.30		MG/KG	0.84	95% UCL-T	W-Test (4)	0.219	Mean-T	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.800	1.57	9.10		MG/KG	1.17	95% UCL-T	W-Test (4)	0.287	Mean-T	W-Test (4)
Dibenz(a,h)anthracene	MG/KG	0.197	0.207	0.220	J	MG/KG	0.207	95% UCL-T	W-Test (4)	0.196	Mean-T	W-Test (4)
Indeno(1,2,3-cd)pyrene	MG/KG	0.217	0.374	1.90		MG/KG	0.326	95% UCL-T	W-Test (4)	0.116	Mean-T	W-Test (4)
2-Amino-4,6-dinitrotoluene	MG/KG	0.315	0.352	2.14	J	MG/KG	0.322	95% UCL-T	W-Test (4)	0.299	Mean-T	W-Test (4)
Aluminum	MG/KG	5,479	5,906	12,000		MG/KG	5,906	95% UCL-N	W-Test (3)	5,479	Mean-N	W-Test (3)
Antimony	MG/KG	1.30	1.70	17.8		MG/KG	1.38	95% UCL-T	W-Test (4)	0.748	Mean-T	W-Test (4)
Arsenic	MG/KG	10.8	13.0	66.1		MG/KG	12.46	95% UCL-T	W-Test (1)	7.46	Mean-T	W-Test (1)
Barium	MG/KG	67.4	84.4	799		MG/KG	73	95% UCL-T	W-Test (4)	49.4	Mean-T	W-Test (4)
Cadmium	MG/KG	1.82	2.61	31.2		MG/KG	3.17	95% UCL-T	W-Test (1)	0.472	Mean-T	W-Test (1)
Chromium	MG/KG	18.6	21.6	124		MG/KG	20.07	95% UCL-T	W-Test (4)	15.3	Mean-T	W-Test (4)
Copper	MG/KG	122	205	4,000		MG/KG	100.1	95% UCL-T	W-Test (4)	31.5	Mean-T	W-Test (4)
Iron	MG/KG	11,194	12,101	32,600		MG/KG	12,425	95% UCL-T	W-Test (1)	10,097	Mean-T	W-Test (1)
Lead	MG/KG	968	1,657	31,200		MG/KG	161	Mean-T	W-Test (1)	161	Mean-T	W-Test (1)
Manganese	MG/KG	182	206	713		MG/KG	220	95% UCL-T	W-Test (1)	143	Mean-T	W-Test (1)
Mercury	MG/KG	51.1	78.0	962		MG/KG	223	95% UCL-T	W-Test (1)	4.18	Mean-T	W-Test (1)
Thallium	MG/KG	0.645	0.721	2.50	J	MG/KG	0.69	95% UCL-T	W-Test (4)	0.566	Mean-T	W-Test (4)
Zinc	MG/KG	437	593	6,000		MG/KG	554	95% UCL-T	W-Test (1)	178	Mean-T	W-Test (1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.2

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Mercury	MG/KG	51.1	78.0	962		MG/KG	223	95% UCL-T	W-Test (1)	4.18	Mean-T	W-Test (1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.3

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	MG/KG	12.1	63.5	20.2		MG/KG	20.2	Max.	W-Test (5)	12.1	Mean-N	W-Test (6)
Mercury	MG/KG	21.6	40.2	24.5		MG/KG	24.5	Max.	W-Test (5)	21.6	Mean-N	W-Test (6)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Used distribution data more closely fit.
(5) Maximum detected concentration used because sample size is less than 5.
(6) Mean value used because sample size is less than 5.

Table 3.4

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Arsenic	UG/L	47.0		47.0		UG/L	47.0	(5)		47.0	(6)	
Manganese	UG/L	1,300		1,300		UG/L	1,300	(5)		1,300	(6)	

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilks W Test indicates data are normally distributed.
(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.
(5) Maximum concentration used for EPC because fewer than five samples.
(6) Mean-N concentration used for CT EPC because fewer than five samples.

Table 3.5

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	MG/KG	0.658	1.31	7.70		MG/KG	0.958	95% UCL-T	W-Test (4)	0.233	Mean-T	W-Test (4)
Benzo(a)pyrene	MG/KG	0.568	1.10	6.30		MG/KG	0.84	95% UCL-T	W-Test (4)	0.219	Mean-T	W-Test (4)
Benzo(b)fluoranthene	MG/KG	0.800	1.57	9.10		MG/KG	1.17	95% UCL-T	W-Test (4)	0.287	Mean-T	W-Test (4)
Dibenz(a,h)anthracene	MG/KG	0.197	0.207	0.220	J	MG/KG	0.207	95% UCL-T	W-Test (4)	0.196	Mean-T	W-Test (4)
Indeno(1,2,3-cd)pyrene	MG/KG	0.217	0.374	1.90		MG/KG	0.326	95% UCL-T	W-Test (4)	0.116	Mean-T	W-Test (4)
2-Amino-4,6-dinitrotoluene	MG/KG	0.315	0.352	2.14	J	MG/KG	0.322	95% UCL-T	W-Test (4)	0.299	Mean-T	W-Test (4)
Aluminum	MG/KG	5,479	5,906	12,000		MG/KG	5,906	95% UCL-N	W-Test (3)	5,479	Mean-N	W-Test (3)
Antimony	MG/KG	1.30	1.70	17.8		MG/KG	1.38	95% UCL-T	W-Test (4)	0.748	Mean-T	W-Test (4)
Arsenic	MG/KG	10.8	13.0	66.1		MG/KG	12.46	95% UCL-T	W-Test (1)	7.46	Mean-T	W-Test (1)
Barium	MG/KG	67.4	84.4	799		MG/KG	73	95% UCL-T	W-Test (4)	49.4	Mean-T	W-Test (4)
Cadmium	MG/KG	1.82	2.61	31.2		MG/KG	3.17	95% UCL-T	W-Test (1)	0.472	Mean-T	W-Test (1)
Chromium	MG/KG	18.6	21.6	124		MG/KG	20.07	95% UCL-T	W-Test (4)	15.3	Mean-T	W-Test (4)
Copper	MG/KG	122	205	4,000		MG/KG	100.1	95% UCL-T	W-Test (4)	31.5	Mean-T	W-Test (4)
Iron	MG/KG	11,194	12,101	32,600		MG/KG	12,425	95% UCL-T	W-Test (1)	10,097	Mean-T	W-Test (1)
Lead	MG/KG	968	1,657	31,200		MG/KG	161	Mean-T	W-Test (1)	161	Mean-T	W-Test (1)
Manganese	MG/KG	182	206	713		MG/KG	220	95% UCL-T	W-Test (1)	143	Mean-T	W-Test (1)
Mercury	MG/KG	51.1	78.0	962		MG/KG	223	95% UCL-T	W-Test (1)	4.18	Mean-T	W-Test (1)
Thallium	MG/KG	0.645	0.721	2.50	J	MG/KG	0.69	95% UCL-T	W-Test (4)	0.566	Mean-T	W-Test (4)
Zinc	MG/KG	437	593	6,000		MG/KG	554	95% UCL-T	W-Test (1)	178	Mean-T	W-Test (1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

Table 3.6

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Sites 49, 50, 54 and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Mercury	MG/KG	51.1	78.0	962		MG/KG	223	95% UCL-T	W-Test (1)	4.18	Mean-T	W-Test (1)

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T);
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL (or mean) exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilks W Test indicates data are normally distributed.

(4) Shapiro-Wilks W Test inconclusive. Use of 95% UCL (normal or transformed) that best fits the data according to the results of the Shapiro-Wilks W Test for EPC.

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	- -	see Table 3.1	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992 (1)	2,000	EPA, 1992 (1)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.32	EPA, 1997 (2)	0.3	EPA, 1997 (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(2) RME SSAF is soil adherence to hands for Utility Workers No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to hands Utility Workers No. 1 and No. 2 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF is based on maximum adherence factor for utility workers.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	see Table 3	see Table 3.1	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	- -	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	see Table 3	see Table 3.1	see Table 3	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992, (2)	2,000	EPA, 1992, (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (3)	0.11	EPA, 1997, (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	- -	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(3) RME and CT SSAF is soil adherence to hands for Soccer No. 1 from EPA, 1997, Table 6-12.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	see Table 3	see Table 3.1	see Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.1	see Table 3	see Table 3.1	see Table 3	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,600	EPA, 1992	3,700	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997, (2)	0.11	EPA, 1997, (2)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	9	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) RME and CT SSAF is soil adherence to hands for Soccer No. 1 from EPA, 1997, Table 6-12.

(3) SA is assumed to be 25% of the total skin surface area for 12-15 year old male.Total is 1.49m2 for 50th percentile and 1.85 m2for 95th percentile.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.2	- -	see Table 2.2	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.5	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA,1991	219	EPA, 1993	
	ED	Exposure Duration	years	25	EPA, 1991	5	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	1,825	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rate for adult, sedentary activities.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Risk-Based Concentration Table. October 27, 1999.

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.2	- -	see Table 2.2	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.5	EPA, 1997 (3)	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Inhalation rate for adult, sedentary activities.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Risk-Based Concentration Table. October 27, 1999.

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.2	- -	see Table 3.2	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.2	- -	see Table 2.2	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1991	0.83	EPA, 1991	
	ET	Exposure Time	hr/day	1.8	(1)	1.8	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	9	(3)	9	EPA, 1993	
	BW	Body Weight	kg	37	EPA, 1997	37	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming trespasser would spend a maximum of 1.8 hours at the site.

(2) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(3) Professional Judgement assuming adolescents from 9 to 18 years of age.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	- -	see Table 3.3	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	50	(1)	25	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	- -	see Table 3.3	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,170	EPA, 1997	1,960	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	36	EPA, 1997, (4)	22.75	EPA, 1997, (4)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995b	chem specific	EPA, 1995b	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 1/2 the default value for the residential soil scenario per comment from EPA Region III, June 16, 1998, and 1/2 the RME value for the CT.

(2) Professional Judgement assuming 2 days per week for 6 months per year for the RME and 1/2 the RME value for the CT.

(3) RME SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the feet and hands.

(4) RME SSAF is soil adherence to legs for Kids No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to legs Kids No. 1 and No. 2 from EPA, 1997, Table 6-12.

NA - Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	- -	see Table 3.3	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-Sed	Ingestion Rate of Sediment	mg/day	100	(1)	50	(1)	CSed x IR-Sed x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(2)	26	(2)	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CSed	Chemical Concentration in Sediment	mg/kg	see Table 3.3	- -	see Table 3.3	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	1,550	EPA, 1997	588	EPA, 1997	CSed x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	36	EPA, 1997, (4)	22.75	EPA, 1997, (4)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995b	chem specific	EPA, 1995b	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	52	(4)	26	(4)	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Professional Judgement assuming 1/2 the default value for the residential soil scenario per comment from EPA Region III, June 16, 1998, and 1/2 the RME value for the CT.

(2) Professional Judgement assuming 2 days per week for 6 months per year for the RME and 1/2 the RME value for the CT.

(3) RME SA is 30 percent of the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs. CT SA is 30 percent of the sum of the mean surface areas (for a male) of the feet and hands.

(4) RME SSAF is soil adherence to legs for Kids No. 1 from EPA, 1997, Table 6-12. CT SSAF is average soil adherence to legs Kids No. 1 and No. 2 from EPA, 1997, Table 6-12.

NA - Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03. (soil exposure factors used for sediment, and 1/2 the RME value for the CT).

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.4	- -	see Table 3.4	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.01	EPA, 1996	0.01	EPA, 1996	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.4	- -	see Table 3.4	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,170	EPA, 1997	1,960	EPA, 1997	DAevent x SA x EF x ED x 1/BW x 1/AT
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	(2)	Inorganics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	PC x CSW x ET x CF1 x CF2
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1991	
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	Organics: DAevent (mg/cm2-event) =
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	2 x PC x CSW x (sqrt((6 x t x ET)/3.1415))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Not available, used RME value.

(3) RME SA is the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the feet and hands.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Supplemental Guidance to RAGS: Region 4 Bulletins

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.4	- -	see Table 3.4	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-SW	Ingestion Rate of Surface Water	l/hour	0.05	EPA, 1996	0.05	EPA, 1996	CSW x IR-SW x ET x EF x ED x CF1 x
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	EPA, 1989	1/BW x 1/AT
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CSW	Chemical Concentration in Surface Water	µg/l	see Table 3.4	- -	see Table 3.4	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	1,550	EPA, 1997	588	EPA, 1997	DAevent x SA x EF x ED x 1/BW x 1/AT
	PC	Permeability Constant	cm/hr	chem specific	EPA, 1992	chem specific	EPA, 1992	
	CF1	Conversion Factor 1	mg/µg	0.001	- -	0.001	- -	
	ET	Exposure Time	hr/day	2.6	EPA, 1989	2.6	(2)	Inorganics: DAevent (mg/cm2-event) =
	EF	Exposure Frequency	days/year	52	(1)	26	(1)	PC x CSW x ET x CF1 x CF2
	ED	Exposure Duration	years	6	EPA, 1991	6	EPA, 1991	
	CF2	Conversion Factor 2	l/cm^3	0.001	- -	0.001	- -	Organics: DAevent (mg/cm2-event) =
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	2 x PC x CSW x (sqrt((6 x t x ET)/3.1415))
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	x CF1 x CF2
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME and 1/2 the RME value for the CT.

(2) Not available, used RME value.

(3) RME SA is 30 percent of the sum of the mean surface areas (for a male) of the hands, forearms, feet, and lower legs. CT SA is 30 percent of the sum of the mean surface areas (for a male) of the feet and hands.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Supplemental Guidance to RAGS: Region 4 Bulletins

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

SA: Surface area in contact with surface water are based on ranges. For the child, the total body surface area ranges from 6,160 to 8,760 cm^2 of a 3- to 6-year-old male; the mean value of 7,280 cm^2 is used for the RME and 6,160 cm^2 is used for the CT value.

TABLE 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ----	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1991	100	EPA, 1997	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table ----	- -	see Table ----	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,300	EPA, 1992 (2)	2,000	EPA, 1992 (2)	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.24	EPA, 1997 (3)	0.18	EPA, 1997 (3)	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	(1)	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Not available, used RME value.

(2) RME SA is the sum of the mean surface areas (for a male) of the head, hands, forearms, and lower legs. CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(3) RME SSAF is soil adherence to hands for Construction Workers from EPA, 1997, Table 6-12. CT is 0.75 times the RME per discussions with EPA and NEHC on November 22, 1999.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF is based on maximum adherence factor for construction workers.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,800	EPA, 1997	5,000	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 1997	0.2	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF based on maximum adherence factor for gardeners.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

SA: Based on 25% of total body surface area for adult (25% of 23,000 cm^2 for RME and 25% of 20,000 cm^2 for CT).

TABLE 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	2,379	EPA, 1997	2,094	EPA, 1997	CS x SA x SSAF x DABS x CF3 x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.11	EPA, 1997	0.11	EPA, 1992	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa; SSAF based on maximum adherence factor for soccer players.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

SA: Skin surface area for the RME is based on the 50th percentile total surface area for the child ages 5-6 years (Table 6-6 of EPA, 1999). The CT value is based on the average between the 50th percentile surface areas for the child ages 2-3 years and 5-6 years.

TABLE 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
	IR-S-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	EPA, 1993	
	IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	mg-year/kg-day	114.29	calculated	46.43	calculated	IR-S-Adj (mg-year/kg-day) =
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	(ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	see Table 3.5	- -	see Table 3.5	- -	CDI (mg/kg-day) =
	SA-A	Skin Surface Area Available for Contact, Adult	cm^2	5,800	EPA, 1992	5,000	EPA, 1992	CS x DA-Adj x DABS x CF3 x EF x 1/AT
	SA-C	Skin Surface Area Available for Contact, Child	cm^2	2,379	EPA, 1997	2,094	EPA, 1997	
	SSAF-A	Soil to Skin Adherence Factor, Adult	mg/cm^2-day	0.2	EPA, 1997a	0.2	EPA, 1992	
	SSAF-C	Soil to Skin Adherence Factor, Child	mg/cm^2-day	0.11	EPA, 1997a	0.11	EPA, 1992	DA-Adj (mg-year/kg-day) =
	DA-Adj	Dermal Absorption, Age-adjusted	mg-year/kg-day	502.39	calculated	220.71	calculated	[(ED-C x SA-C / BW-C)*SSAF-C + (ED-A x SA-A / BW-A)*SSAF-A]
	DABS	Dermal Absorption Factor Solids	--	chem specific	EPA, 1995	chem specific	EPA, 1995	
	CF3	Conversion Factor 3	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	BW-A	Body Weight , Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 1997b: Risk Assessment Guidance for Superfund. Vol.1: Supplemental guidance, Dermal Risk Assessment Guidance. Interim Guidance. NCEA-W-0364.

DABS: Based on Region III Technical Guidance "Assessing Dermal Exposure from Soil, December 1995", for constituents not listed used volatile organics value of 20%, sem volatile organics value of 10%, and Inorganics value of 1%.

TABLE 4.15

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	2.5	EPA, 1997 (2)	1.5	EPA, 1997 (2)	
	ET	Exposure Time	hr/day	8	(1)	4	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	250	EPA, 1993	219	EPA, 1993	
	ED	Exposure Duration	years	1	EPA, 1991	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	365	EPA, 1989	

(1) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME and 1/2 of a day for the CT.

(2) Inhalation rates are based on values for the outdoor worker assuming heavy activity for the RME and moderate activity for the CT (EPA, 1997, page 5-24).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

Calc. (1): Calculated in Appendix--- Section Generation of Fugitive Dust During Construction Activites.

TABLE 4.16

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Fugivite Dust Concentration in Air	m^3/kg	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	
	ET	Exposure Time	hr/day	24	(1)	24	(1)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA,1993	
	ED	Exposure Duration	years	24	EPA, 1991	9	EPA, 1993	
	BW	Body Weight	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989	3,285	EPA, 1989	

(1) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.17

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	
	IN	Inhalation Rate	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED	Exposure Duration	years	6	EPA, 1991	6	(1)	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 4.18

VALUES USED FOR DAILY INTAKE CALCULATIONS

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from exposed Surface Soil
Receptor Population: Resident
Receptor Age: Child/Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	see Table 3.6	- -	see Table 3.6	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
	CA	Chemical Concentration in Air	mg/m^3	see Table 2.6	- -	see Table 2.6	- -	CA x IN-S-Adj x ET x EF x 1/AT
	PEF	Particulate Emissions Factor	kg/m^3	1.32E+09	EPA, 1996	1.32E+09	EPA, 1996	
	VF	Volatilization Factor for volatile constituents	m^3/kg	calc	EPA, 1996	calc	EPA, 1996	IN-S-Adj (m^3-year/kg-hour) =
	IN-S-A	Inhalation Rate, Adult	$m^3/hour$	0.83	EPA, 1999	0.83	EPA, 1999	(ED-C x IN-S-C / BW-C) + (ED-A x IN-S-A / BW-A)
	IN-S-C	Inhalation Rate, Child	$m^3/hour$	0.5	EPA, 1999	0.5	EPA, 1999	
	IN-S-Adj	Inhalation Rate, Age-adjusted	m^3-year/kg-hour	0.49	calculated	0.31	calculated	
	ET	Exposure Time	hr/day	24	(2)	24	(2)	CA (mg/m^3) = CS (1/PEF + 1/VF)
	EF	Exposure Frequency	days/year	350	EPA, 1991	234	EPA, 1993	
	ED-A	Exposure Duration, Adult	years	24	EPA, 1991	9	EPA, 1993	
	ED-C	Exposure Duration, Child	years	6	EPA, 1991	6	(1)	
	BW-A	Body Weight, Adult	kg	70	EPA, 1991	70	EPA, 1991	
	BW-C	Body Weight, Child	kg	15	EPA, 1991	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

(1) Not available, used RME value.

(2) Professional Judgement conservatively assumed all day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1999: Region III Risk-Based Concentration Table. October 27, 1999.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Benzo(a)anthracene	Chronic	N/A								
	Subchronic	N/A								
Benzo(a)pyrene	Chronic	N/A								
	Subchronic	N/A								
Benzo(b)fluoranthene	Chronic	N/A								
	Subchronic	N/A								
Dibenzo(a,h)anthracene	Chronic	N/A								
Indeno(1,2,3-cd)pyrene	Chronic	N/A								
Aminodinitrotoluenes	Chronic	6.0E-05	mg/kg-day	80%	4.8E-05	mg/kg-day			NCEA	08/30/2000
	Subchronic	N/A								
Aluminum	Chronic	1.0E+00	mg/kg-day	27%	2.7E-01	mg/kg-day	CNS	100	NCEA	08/26/1996
	Subchronic	N/A								
Antimony	Chronic	4.0E-04	mg/kg-day	10%	4.0E-05	mg/kg-day	Blood	1000/1	IRIS	08/08/2001
	Subchronic	4.0E-04	mg/kg-day	10%	4.0E-05	mg/kg-day	Blood	1000	HEAST	07/08/1998
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/vascular	3/1	IRIS	08/08/2001
	Subchronic	3.0E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin/vascular	3	HEAST	07/08/1998
Barium	Chronic	7.0E-02	mg/kg-day	100%	7.0E-02	mg/kg-day	Kidney	3/1	IRIS	08/08/2001
	Subchronic	7.0E-02	mg/kg-day	100%	7.0E-02	mg/kg-day	Kidney	3/1	HEAST	07/08/1998
Cadmium (water)	Chronic	5.0E-04	mg/kg-day	5%	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	08/08/2001
(for water and air)	Subchronic	N/A								
Cadmium (food)	Chronic	1.0E-03	mg/kg-day	3%	2.5E-05	mg/kg-day	Kidney	10/1	IRIS	08/08/2001
(for soil)	Subchronic	N/A								
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	1%	3.0E-05	mg/kg-day	NOAEL	300/3	IRIS	08/08/2001
	Subchronic	2.0E-02	mg/kg-day	1%	2.0E-04	mg/kg-day	NOAEL	100	HEAST	07/08/1998
Copper	Chronic	4.0E-02	mg/kg-day	60%	2.4E-02	mg/kg-day	Gastrointestinal		HEAST	07/1997
	Subchronic	4.0E-02	mg/kg-day	60%	2.4E-02	mg/kg-day	Gastrointestinal		HEAST	07/1997
Iron	Chronic	3.0E-01	mg/kg-day	20%	6.0E-02	mg/kg-day	Gastrointestinal	1	NCEA	07/23/1996
Lead	Chronic	N/A								
	Subchronic	N/A								
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	35%	7.0E-03	mg/kg-day	CNS	1/1	IRIS	08/08/2001
	Subchronic	N/A								
Manganese (food)	Chronic	1.4E-01	mg/kg-day	5%	7.0E-03	mg/kg-day	CNS	1/1	IRIS	03/12/2001
	Subchronic	N/A								

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Mercury	Chronic	N/A								
Mercuric chloride	Chronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Immune System	1000	IRIS	03/12/2001
	Subchronic	3.0E-04	mg/kg-day	100%	3.0E-04	mg/kg-day	Kidney	1000	HEAST	07/1998
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin/vascular	3/1	IRIS	04/10/1998
	Subchronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Skin	3	HEAST	07/00/97
Zinc	Chronic	3.0E-01	mg/kg-day	25%	7.5E-02	mg/kg-day	Blood	3/1	IRIS	03/15/2001
	Subchronic	3.0E-01	mg/kg-day	25%	7.5E-02	mg/kg-day	Blood	3	HEAST	07/1997

N/A = Not Applicable or Not Available. IRIS indicates that calculations of dermal risks may not be appropriate for this chemical.

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation* , April 8, 1999.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals - 20%.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(2) Provide equation for derivation in text.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

RESP = Respiratory System

CNS = Central Nervous System

NOAEL = No adverse effect level

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)
Benzo(a)anthracene	Chronic	N/A							
	Subchronic	N/A							
Benzo(a)pyrene	Chronic	N/A							
	Subchronic	N/A							
Benzo(b)fluoranthene	Chronic	N/A							
	Subchronic	N/A							
Dibenzo(a,h)anthracene	Chronic	N/A							
Indeno(1,2,3-cd)pyrene	Chronic	N/A							
Aminodinitrotoluenes	Chronic	N/A							
	Subchronic	N/A							
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	RBC	10/5/2000
	Subchronic	N/A							
Antimony	Chronic	N/A							
	Subchronic	N/A							
Arsenic	Chronic	N/A							
	Subchronic	N/A							
Barium	Chronic	4.90E-04	mg/m^3	1.40E-04	mg/kg-day	Cardiovascular		ATSDR	
	Subchronic	N/A							
Cadmium (water)	Chronic	2.0E-04	mg/m3	5.7E-05	mg/kg-day	Kidney	N/A	NCEA	
	Subchronic	9.0E-04	mg/m3	2.6E-04	mg/kg-day	Kidney	N/A	NCEA	
Cadmium (food)	Chronic	2.0E-04	mg/m3	5.7E-05	mg/kg-day	Kidney	N/A	NCEA	
	Subchronic	9.0E-04	mg/m3	2.6E-04	mg/kg-day	Kidney	N/A	NCEA	
Chromium (hexavalent)	Chronic	1.05E-04	mg/m^3	3.00E-05	mg/kg-day	Respiratory System	90/1	IRIS	08/08/2001
	Subchronic	4.00E-06	mg/m^3	1.14E+06	mg/kg-day	Respiratory System	100	NCEA	05/14/1993
Copper	Chronic	N/A							
Iron	Chronic	N/A							
	Subchronic	N/A							
Lead	Chronic	N/A							
Manganese	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000/1	IRIS	08/08/2001
	Subchronic	N/A							
Mercury	Chronic	3.01E-04	mg/m^3	8.6E-05	mg/kg-day	CNS	30	IRIS	08/08/2001
	Subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	HEAST	07/1998
Mecuric chloride	Chronic	NA							
Thallium	Chronic	N/A							
Zinc	Chronic	N/A							

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ (2)	Dates (3) (MM/DD/YY)

N/A = Not Applicable

(1) Provide equation used for derivation in text.

(2) HEAST, Alternative Methods used as source of barium values.

Chromium and cadmium values were withdrawn from HEAST, but available in Region III RBC Table.

(3) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of the article provided by NCEA.

ATSDR = Agency for Toxic Substances and Disease Registry

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

HEAST(3) = Health Effects Assessment Summary Tables, Alternate Methods

HEAST(4)= Health Effects Assessment Summary Tables, Withdrawn

NCEA = National Center for Environmental Assessment

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Benzo(a)anthracene	7.3E-01	NU		$(mg/kg\text{-}day)^{-1}$	B2	E	07/01/1993
Benzo(a)pyrene	7.3E+00	NU		$(mg/kg\text{-}day)^{-1}$	B2	IRIS	08/08/2001
Benzo(b)fluoranthene	7.3E-01	NU		$(mg/kg\text{-}day)^{-1}$	B2	E	07/01/1993
Dibenz(a,h)anthracene	7.3E+00	NU		$(mg/kg\text{-}day)^{-1}$	B2	E	07/01/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	NU		$(mg/kg\text{-}day)^{-1}$	B2	E	07/01/1993
Aminodinitrotoluenes	N/A						
Aluminum	N/A						
Antimony	N/A						
Arsenic	1.5E+00	95%	1.6E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	08/08/2001
Barium	N/A						
Cadmium-Food	N/A						
Cadmium-Water	N/A						
Chromium (hexavalent)	N/A						
Copper	N/A						
Iron	N/A						
Lead	N/A						
Manganese (food)	N/A						
Manganese (nonfood)	N/A						
Mercury	N/A						
Thallium	N/A						
Zinc	N/A						

NU-Did not use the oral slope factor for dermal evaluation because the chemicals may act directly at the point of contact per Memorandum from Jennifer Hubbard, 12/19/96.

N/A-Not available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

U = Under review.

EPA Carcinogen Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates 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

(1) Refer to RAGS, Part A. Source is EPA Region III *Oral Absorption Values for Oral-to-Dermal Extrapolation*, April 8, 1999.

Dermal carcinogenicity should not be assessed for the carcinogenic PAHs, as these chemicals may act directly at the point of contact.

For constituents not available in the Region III document the following general values were used: VOCs - 80%, Pesticides/PCBs - 50%, dioxins/furans - 50%, and metals

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide article date provided by NCEA.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Benzo(a)anthracene	N/A							
Benzo(a)pyrene	8.9E-04	(ug/m3) $^{-1}$	3500	3.1E+00	(mg/kg-day) $^{-1}$	B2	E	1997
Benzo(b)fluoranthene	N/A							
Dibenz(a,h)anthracene	N/A							
Indeno(1,2,3-cd)pyrene	N/A							
Aminodinitrotoluenes	N/A							
Aluminum	N/A							
Antimony	N/A							
Arsenic	4.0E-03	(ug/m3) $^{-1}$	3500	1.5E+01	(mg/kg-day) $^{-1}$	A	IRIS	08/08/2001
Barium	N/A							
Cadmium	1.8E-03	(ug/m3) $^{-1}$	3500	6.3E+00	(mg/kg-day) $^{-1}$	B1	IRIS	08/08/2001
Chromium	1.2E-02	(ug/m3) $^{-1}$	3500	4.1E+01	(mg/kg-day) $^{-1}$	A	HEAST	06/13/1998
Copper	N/A							
Iron	N/A						NCEA	07/23/1996
Lead	N/A							
Manganese	N/A					D	IRIS	08/08/2001
Mercury	N/A							
Thallium	N/A						RBC	10/05/2000
Zinc	N/A							

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
U = Under review.
N/A = Not Available

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.
For RBC values, provide the date of last change in the Tables.

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates 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 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	9.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	8.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	3.2E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	5.3E-03
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	5.8E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	5.8E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.4E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	3.4E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.1E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	7.1E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.0E-03
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	3.1E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	3.1E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.0E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	6.5E-03
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	9.8E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	2.4E-03
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.2E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	4.1E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.1E-02
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.2E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.3E-01
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	6.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	9.6E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	5.4E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.8E-03
	(Total)												8.6E-01

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.7E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	3.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	5.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.3E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	1.1E-02
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	9.8E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.6E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.3E-07	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	5.7E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	6.6E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.3E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.2E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.7E-04
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	5.3E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.1E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.3E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E-01
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.7E-05	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	6.9E-04
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.1E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.4E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.7E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.2E-03
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-01
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.6E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	9.2E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	1.2E-03
													3.4E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	4.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	6.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	6.6E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	1.1E-03
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	1.2E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	1.2E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.8E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	7.0E-04
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	2.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.5E-03
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.5E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	2.1E-04
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	6.5E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	6.5E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	4.1E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	1.4E-03
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	2.0E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	5.1E-04
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.5E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.4E-03
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	4.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	2.2E-03
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	4.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.5E-01
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.0E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	1.1E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	3.8E-04
	(Total)												1.8E-01

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	3.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	3.8E-08	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	8.0E-04
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	7.0E-05	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	2.6E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.6E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	4.1E-04
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	4.7E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.7E-03
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	8.7E-07	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.2E-05
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	3.8E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.5E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.4E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	7.9E-03
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.2E-06	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	4.9E-05
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.5E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.5E-03
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.6E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	3.7E-04
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.8E-03
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	8.2E-09	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.2E-04
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	6.6E-06	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	8.8E-05
													2.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	3.7E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	3.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	4.5E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	8.0E-09	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.2E-08	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.1E-04
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	2.3E-04	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.3E-08	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.3E-04
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	4.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.6E-03
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	2.8E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	4.0E-05
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.2E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.2E-04
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	7.7E-07	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.6E-04
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	3.9E-06	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	9.6E-05
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	4.8E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.6E-03
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	8.5E-06	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.2E-04
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	8.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.9E-02
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	2.7E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.8E-04
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	7.1E-05
	(Total)												3.4E-02

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	2.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	6.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	6.3E-08	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	1.3E-03
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	1.2E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	4.3E-04
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.7E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	6.7E-04
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	7.8E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.7E-03
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.4E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	2.0E-05
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	6.2E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.5E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.9E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.3E-02
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	2.0E-06	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	8.1E-05
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.4E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	4.0E-03
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	4.3E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	6.1E-04
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	4.3E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-02
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.3E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.9E-04
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	1.1E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	1.4E-04
													4.0E-02
												Total Hazard Index Across All Exposure Routes/Pathways	7.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.4.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	3.4E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E+00
	(Total)												1.1E+00
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.5.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.3E-02
	(Total)												5.3E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.3E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.6.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	3.0E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-01
	(Total)												1.0E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.0E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.7.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2.0E+01	mg/kg	2.0E+01	µg/l	M	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.9E-03
	Mercury	2.5E+01	mg/kg	2.5E+01	µg/l	M	2.5E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.3E-03
	(Total)												1.5E-02
Dermal Absorption	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	2.4E-03	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	8.6E+00
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	9.3E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.1E-01
	(Total)												8.9E+00
												Total Hazard Index Across All Exposure Routes/Pathways	8.9E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.8.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2.0E+01	mg/kg	2.0E+01	µg/l	M	1.9E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.4E-02
	Mercury	2.5E+01	mg/kg	2.5E+01	µg/l	M	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.8E-02
	(Total)												1.4E-01
Dermal Absorption	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	3.4E-03	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.2E+01
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	1.3E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.3E-01
	(Total)												1.2E+01
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.9.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	2.5E-06	mg/kg-day	9.0E-03	mg/kg-day	N/A	N/A	2.8E-04
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	6.9E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	9.8E-03
	(Total)												1.0E-02
Dermal Absorption	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	1.3E-06	mg/kg-day	7.2E-03	mg/kg-day	N/A	N/A	1.8E-04
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	3.6E-05	mg/kg-day	1.4E-04	mg/kg-day	N/A	N/A	2.5E-01
	(Total)												2.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.6E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

Table 7.9.RME Supplement
Calculation of DAevent (Adult)
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, NSWC - Indian Head

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Arsenic	4.7E+01	µg/l	1.0E-03	N/A	2.6	1.2E-07
Manganese	1.3E+03	µg/l	1.0E-03	N/A	2.6	3.4E-06

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.10.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	5.8E-05	mg/kg-day	9.0E-03	mg/kg-day	N/A	N/A	6.4E-03
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	1.6E-03	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	2.3E-01
	(Total)												2.4E-01
Dermal Absorption	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	1.8E-06	mg/kg-day	7.2E-03	mg/kg-day	N/A	N/A	2.5E-04
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	5.0E-05	mg/kg-day	1.4E-04	mg/kg-day	N/A	N/A	3.6E-01
	(Total)												3.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.9E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

Table 7.10.RME Supplement
Calculation of DAevent (Adult)
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, NSWC - Indian Head

Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Arsenic	4.7E+01	µg/l	1.0E-03	N/A	2.6	1.2E-07
Manganese	1.3E+03	µg/l	1.0E-03	N/A	2.6	3.4E-06

Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	4.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	3.9E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	5.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	9.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.5E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.5E-02
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	2.8E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.8E-02
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.5E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.6E-02
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	5.9E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.0E-01
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	3.4E-04	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	4.9E-03
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.5E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	1.5E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	9.4E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	4.7E-03
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	4.7E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	1.2E-02
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	5.8E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.9E-01
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.0E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	5.2E-02
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.0E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.5E+00
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	3.2E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.6E-02
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.6E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	8.7E-03
	(Total)												4.1E+00

TABLE 7.11.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	4.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.0E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	8.3E-03
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	7.4E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	2.7E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.7E-07	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	4.3E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	5.0E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	1.7E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	9.1E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.3E-04
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	3.9E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.6E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.5E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	8.3E-02
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.2E-05	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	5.2E-04
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.5E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	2.6E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.7E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	3.9E-03
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.3E-02
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	8.6E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.2E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	6.9E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	9.2E-04
													2.6E-01
												Total Hazard Index Across All Exposure Routes/Pathways	4.3E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	4.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	7.4E-03
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	8.1E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	8.1E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.9E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	4.7E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	1.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.7E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.0E-04	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.4E-03
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	4.3E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.3E-03
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.7E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	9.2E-03
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.4E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.4E-03
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.7E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.7E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.0E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.1E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E+00
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	9.5E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.4E-02
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	7.6E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.5E-03
	(Total)												1.2E+00

TABLE 7.12.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.9E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	3.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	5.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.1E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	1.1E-02
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	9.4E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.5E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.2E-07	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	5.5E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	6.3E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.2E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.2E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.7E-04
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	5.0E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.0E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.2E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E-01
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.6E-05	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	6.6E-04
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.0E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.3E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.5E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.0E-03
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-01
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.1E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.6E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	8.8E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	1.2E-03
													3.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.2E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.1E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	4.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.1E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	6.9E-02
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	7.6E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	7.6E-02
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.8E-05	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	4.4E-02
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	1.6E-04	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.3E-01
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	9.3E-04	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.3E-02
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	4.1E-05	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.1E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.6E-04	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	8.6E-02
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.3E-03	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.2E-02
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.6E-01	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.3E-01
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.8E-03	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	1.4E-01
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.9E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	9.5E+00
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	8.8E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.3E-01
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	7.1E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.4E-02
	(Total)												1.1E+01

TABLE 7.13.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.6E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	2.0E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	3.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	5.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.4E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	1.1E-02
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	9.9E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	3.7E-03
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.3E-07	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	5.8E-03
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	6.7E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.3E-02
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.2E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	1.7E-04
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	5.3E-07	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	2.1E-02
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.4E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.1E-01
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.7E-05	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	7.0E-04
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.1E-03	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	3.5E-02
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.7E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	5.3E-03
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.7E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-01
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.2E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	1.6E-03
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	9.3E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	1.2E-03
													3.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.14.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	1.0E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.4E+00
	(Total)												3.4E+00
												Total Hazard Index Across All Exposure Routes/Pathways	3.4E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.15.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	1.4E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.7E+00
	(Total)												4.7E+00
												Total Hazard Index Across All Exposure Routes/Pathways	4.7E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.16.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/m3	M	4.0E-03	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.3E+01
	(Total)												1.3E+01
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E+01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.17.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	8.4E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	5.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.1E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	3.2E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.0E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	2.1E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.0E-04
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	2.0E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.0E-04
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.6E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.2E-03
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.4E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.4E-04
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	4.3E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E-02
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	6.1E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.1E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.0E-03
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.4E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.5E-03
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	7.6E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.5E-04
	(Total)												4.6E-02

TABLE 7.17.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	5.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.5E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	3.2E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.8E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	1.0E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	3.8E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	9.6E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	1.2E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	4.3E-03
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	2.5E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.6E-05
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	2.4E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	9.7E-04
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	7.9E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	2.6E-02
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.6E-06	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	6.8E-05
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	5.2E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	8.7E-03
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	7.3E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.0E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	2.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	7.2E-04
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.9E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	4.2E-04
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	9.1E-06	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	1.2E-04
													4.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	9.4E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.18.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.2E+00	mg/kg	9.7E-05	mg/m3	M	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.6E-03
	(Total)												5.6E-03
												Total Hazard Index Across All Exposure Routes/Pathways	5.6E-03

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.19.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.2E+01	mg/kg	1.2E+01	µg/l	M	3.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.0E-03
	Mercury	2.2E+01	mg/kg	2.2E+01	µg/l	M	5.5E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.8E-03
	(Total)												2.8E-03
Dermal Absorption	Arsenic	1.2E+01	µg/l	1.2E+01	µg/l	M	1.7E-04	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	6.1E-01
	Mercury	2.2E+01	µg/l	2.2E+01	µg/l	M	9.8E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	3.3E-02
	(Total)												6.5E-01
												Total Hazard Index Across All Exposure Routes/Pathways	6.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.20.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.2E+01	mg/kg	1.2E+01	µg/l	M	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.8E-03
	Mercury	2.2E+01	mg/kg	2.2E+01	µg/l	M	2.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	8.5E-03
	(Total)												1.3E-02
Dermal Absorption	Arsenic	1.2E+01	µg/l	1.2E+01	µg/l	M	2.4E-04	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	8.6E-01
	Mercury	2.2E+01	µg/l	2.2E+01	µg/l	M	1.4E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.6E-02
	(Total)												9.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	9.2E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.21.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.5E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	1.7E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	9.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.6E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	4.3E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	4.7E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	4.7E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	6.4E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	1.6E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	6.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	2.1E-02
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	4.2E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	6.0E-04
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	4.0E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	4.0E-04
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.3E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.6E-04
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	2.7E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	6.8E-04
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	8.7E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.9E-02
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	1.2E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	6.1E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	3.6E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.2E-02
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	4.8E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	6.9E-03
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	1.5E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	5.1E-04
	(Total)												8.9E-02

TABLE 7.21.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	7.2E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	6.8E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	8.9E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	6.1E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	3.6E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	9.2E-08	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	1.9E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	1.7E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	6.3E-04
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	2.3E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	5.8E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	7.4E-07	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	2.6E-03
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	1.5E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	2.2E-05
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	1.5E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	5.8E-04
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	4.7E-07	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	1.6E-02
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	9.7E-07	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	4.1E-05
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	3.1E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	5.2E-03
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	4.4E-06	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	6.3E-04
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.3E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	4.3E-04
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	1.7E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	2.5E-04
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	5.5E-06	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	7.3E-05
													2.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.22.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	1.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	9.0E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	5.3E-08	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.4E-07	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.3E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.5E-03	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.5E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	3.4E-07	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.6E-04
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-02
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	2.3E-05	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.2E-04
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	2.2E-07	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.2E-04
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	7.0E-06	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.3E-03
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.4E-05	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.6E-04
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	4.6E-03	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	6.5E-05	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.3E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.9E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.4E-03
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.6E-07	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.7E-03
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	8.1E-05	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.7E-04
	(Total)												4.9E-02

TABLE 7.22.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.6E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	1.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.7E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	5.7E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	5.0E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	1.9E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	6.9E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	1.7E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	2.2E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	7.7E-03
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	4.5E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	6.5E-05
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	4.3E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.7E-03
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.4E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	4.7E-02
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	2.9E-06	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	1.2E-04
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	9.2E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.5E-02
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	1.3E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	1.9E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	3.8E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.3E-03
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	5.2E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	7.4E-04
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	1.6E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	2.2E-04
													8.5E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	9.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	8.4E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	4.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-06	mg/kg-day	6.0E-05	mg/kg-day	N/A	N/A	2.1E-02
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.3E-02	mg/kg-day	1.0E+00	mg/kg-day	N/A	N/A	2.3E-02
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	3.2E-06	mg/kg-day	4.0E-04	mg/kg-day	N/A	N/A	8.0E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.1E-01
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	2.1E-04	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	3.0E-03
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	2.0E-06	mg/kg-day	1.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.6E-05	mg/kg-day	3.0E-03	mg/kg-day	N/A	N/A	2.2E-02
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.3E-04	mg/kg-day	4.0E-02	mg/kg-day	N/A	N/A	3.4E-03
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	4.3E-02	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	1.4E-01
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	6.1E-04	mg/kg-day	2.0E-02	mg/kg-day	N/A	N/A	3.0E-02
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	6.0E-02
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.4E-06	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	3.5E-02
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	7.6E-04	mg/kg-day	3.0E-01	mg/kg-day	N/A	N/A	2.5E-03
	(Total)												4.6E-01

TABLE 7.23.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	2.3E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	2.8E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	2.9E-07	mg/kg-day	4.8E-05	mg/kg-day	N/A	N/A	6.1E-03
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	5.4E-04	mg/kg-day	2.7E-01	mg/kg-day	N/A	N/A	2.0E-03
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	7.4E-08	mg/kg-day	4.0E-05	mg/kg-day	N/A	N/A	1.8E-03
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	2.4E-06	mg/kg-day	2.9E-04	mg/kg-day	N/A	N/A	8.2E-03
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	4.9E-06	mg/kg-day	7.0E-02	mg/kg-day	N/A	N/A	6.9E-05
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	4.7E-08	mg/kg-day	2.5E-05	mg/kg-day	N/A	N/A	1.9E-03
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	1.5E-06	mg/kg-day	3.0E-05	mg/kg-day	N/A	N/A	5.0E-02
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	3.1E-06	mg/kg-day	2.4E-02	mg/kg-day	N/A	N/A	1.3E-04
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	9.9E-04	mg/kg-day	6.0E-02	mg/kg-day	N/A	N/A	1.7E-02
	Manganese	1.4E+02	mg/kg	1.4E+02	mg/kg	M	1.4E-05	mg/kg-day	7.0E-03	mg/kg-day	N/A	N/A	2.0E-03
	Mercury	4.2E+00	mg/kg	4.2E+00	mg/kg	M	4.1E-07	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.4E-03
	Thallium	5.7E-01	mg/kg	5.7E-01	mg/kg	M	5.6E-08	mg/kg-day	7.0E-05	mg/kg-day	N/A	N/A	8.0E-04
	Zinc	1.8E+02	mg/kg	1.8E+02	mg/kg	M	1.7E-05	mg/kg-day	7.5E-02	mg/kg-day	N/A	N/A	2.3E-04
													9.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.5E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Chronic. RfD for mercuric chloride used for mercury.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics.
Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 7.24.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.2E+00	mg/kg	9.7E-05	mg/m3	M	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-02
	(Total)												1.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.25.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.2E+00	mg/kg	9.7E-05	mg/m3	M	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	5.9E-02
	(Total)												5.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	5.9E-02

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 7.26.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Mercury	4.2E+00	mg/kg	9.7E-05	mg/m3	M	5.0E-05	mg/kg-day	3.0E-04	mg/kg-day	N/A	N/A	1.7E-01
	(Total)												1.7E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Subchronic value used if available. Chronic value used if no subchronic value available. RfD for mercuric chloride used for mercury.
N/A - not applicable.

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	3.3E-07	mg/kg-day	7.3E-01	1/mg/kg/day	2.4E-07
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	2.9E-07	mg/kg-day	7.3E+00	1/mg/kg/day	2.1E-06
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	4.1E-07	mg/kg-day	7.3E-01	1/mg/kg/day	3.0E-07
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	7.2E-08	mg/kg-day	7.3E+00	1/mg/kg/day	5.3E-07
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.1E-07	mg/kg-day	7.3E-01	1/mg/kg/day	8.3E-08
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.1E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	2.1E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	4.8E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	4.4E-06	mg/kg-day	1.5E+00	1/mg/kg/day	6.5E-06
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	2.6E-05	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	7.0E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	3.5E-05	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	4.3E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	7.7E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	7.8E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	1.9E-04	mg/kg-day	N/A	N/A	N/A
											9.8E-06

TABLE 8.1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	5.7E-07	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	5.0E-07	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	6.9E-07	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	3.5E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	8.2E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	2.4E-06	mg/kg-day	1.6E+00	N/A	3.7E-06
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	4.3E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.9E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	1.2E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	5.9E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	7.4E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.3E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.3E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	4.1E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	3.3E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										3.7E-06
										Total Risk Across All Exposure Routes/Pathways	1.4E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	6.7E-08	mg/kg-day	7.3E-01	1/mg/kg/day	4.9E-08
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	5.9E-08	mg/kg-day	7.3E+00	1/mg/kg/day	4.3E-07
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	8.2E-08	mg/kg-day	7.3E-01	1/mg/kg/day	6.0E-08
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.1E-07
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	2.3E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.7E-08
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.2E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	4.1E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	9.6E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	8.7E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.3E-06
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	5.1E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	7.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	8.7E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.6E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	4.8E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	3.9E-05	mg/kg-day	N/A	N/A	N/A
											2.0E-06

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	3.9E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	3.4E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	4.8E-08	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	8.4E-09	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	2.4E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	5.6E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	1.6E-07	mg/kg-day	1.6E+00	N/A	2.6E-07
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	3.0E-07	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	8.2E-08	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	4.1E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	5.1E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	8.9E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	9.1E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	2.8E-09	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.3E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.6E-07
										Total Risk Across All Exposure Routes/Pathways	2.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	4.7E-08	mg/kg-day	7.3E-01	1/mg/kg/day	3.5E-08
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	4.2E-08	mg/kg-day	7.3E+00	1/mg/kg/day	3.0E-07
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	5.8E-08	mg/kg-day	7.3E-01	1/mg/kg/day	4.2E-08
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	1.0E-08	mg/kg-day	7.3E+00	1/mg/kg/day	7.5E-08
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	1.6E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.2E-08
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	1.6E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	2.9E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	6.8E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	6.2E-07	mg/kg-day	1.5E+00	1/mg/kg/day	9.3E-07
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	3.6E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	1.6E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	9.9E-07	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	5.0E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	6.2E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.1E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.1E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	3.4E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	2.7E-05	mg/kg-day	N/A	N/A	N/A
											1.4E-06

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.3E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.6E-08	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	2.7E-09	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	4.3E-09	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	4.3E-09	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	7.8E-06	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	1.8E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	5.3E-08	mg/kg-day	1.6E+00	N/A	8.3E-08
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	9.7E-08	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	4.2E-09	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	2.7E-08	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.6E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	2.9E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.0E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	9.1E-10	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	7.3E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										8.3E-08
										Total Risk Across All Exposure Routes/Pathways	1.5E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/kg	M	1.2E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/kg	M	5.4E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.6.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Trespasser/Visitor
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/kg	M	3.8E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.7.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	7.0E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.1E-06
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	8.5E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										1.1E-06
Dermal Absorption											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	8.4E-05	mg/kg-day	1.6E+00	1/mg/kg/day	1.3E-04
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	3.2E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										1.3E-04
										Total Risk Across All Exposure Routes/Pathways	1.3E-04

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement.
N/A - not available

TABLE 8.8.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	1.6E-06	mg/kg-day	1.5E+00	1/mg/kg/day	2.5E-06
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	2.0E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										2.5E-06
Dermal Absorption											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	2.9E-05	mg/kg-day	1.6E+00	1/mg/kg/day	4.6E-05
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	1.1E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										4.6E-05
										Total Risk Across All Exposure Routes/Pathways	4.9E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement.
N/A - not available

TABLE 8.9.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	8.5E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.3E-06
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	2.4E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										1.3E-06
Dermal Absorption											
	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	4.1E-06	mg/kg-day	1.6E+00	1/mg/kg/day	6.4E-06
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										6.4E-06
										Total Risk Across All Exposure Routes/Pathways	7.7E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement.
N/A - not available

Table 8.9a.RME Supplement
Calculation of DAevent (Adult)
Site Surface Water
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Arsenic	4.7E+01	µg/l	1.0E-03	N/A	24	1.13E-06
Manganese	1.3E+03	µg/l	1.0E-03	N/A	24	3.12E-05

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.10.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Site Surface Water
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	5.0E-06	mg/kg-day	1.5E+00	1/mg/kg/day	7.5E-06
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	1.7E-03	mg/kg-day	N/A	N/A	N/A
	(Total)										7.5E-06
Dermal Absorption											
	Arsenic	4.7E+01	µg/l	4.7E+01	µg/l	M	1.4E-06	mg/kg-day	1.6E+00	1/mg/kg/day	2.2E-06
	Manganese	1.3E+03	µg/l	1.3E+03	µg/l	M	3.9E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										2.2E-06
										Total Risk Across All Exposure Routes/Pathways	9.7E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.7a.RME Supplement.
N/A - not available

Table 1-8.10a.RME Supplement
Calculation of DAevent (Adult)
Site Surface Water
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Permeability Constant (PC) (cm/hr)	Lag Time (t) (hr)	Duration of Event (ET) (hr)	DAevent (mg/cm^2-event)
Arsenic	4.7E+01	µg/l	1.0E-03	N/A	24	1.13E-06
Manganese	1.3E+03	µg/l	1.0E-03	N/A	24	3.12E-05

Inorganics: DAevent (mg/cn Inorganics: DAevent (mg/cm2-event) =
PC x EPC x ET x 0.001 mg/ug PC x EPC x ET x 0.001 mg/ug x 0.001 l/cm^3

Organics: DAevent (mg/cm2 Organics: DAevent (mg/cm2-event) =
2 x PC x EPC x (sqrt((6 x t x E 2 x PC x EPC x (sqrt((6 x t x ET)/3.1415)) x 0.001 mg/ug x 0.001 l/cm^3

Notes:
Permeability constants and lag time from EPA 1992, Dermal Exposure Assessment: Principals and Applications. ORD, EPA/600/8-91/001B. Default value of 0.001 cm/hour used for inorganics without published values.
N/A - not available or not applicable.

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	6.4E-08	mg/kg-day	7.3E-01	1/mg/kg/day	4.7E-08
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	5.6E-08	mg/kg-day	7.3E+00	1/mg/kg/day	4.1E-07
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	7.9E-08	mg/kg-day	7.3E-01	1/mg/kg/day	5.7E-08
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	1.4E-08	mg/kg-day	7.3E+00	1/mg/kg/day	1.0E-07
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	2.2E-08	mg/kg-day	7.3E-01	1/mg/kg/day	1.6E-08
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.2E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	4.0E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	9.3E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	8.4E-07	mg/kg-day	1.5E+00	1/mg/kg/day	1.3E-06
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	4.9E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	2.1E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	1.3E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	6.7E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	8.3E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	4.6E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	3.7E-05	mg/kg-day	N/A	N/A	N/A
											1.9E-06

TABLE 8.11.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.7E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.5E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	2.1E-08	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	3.7E-09	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	5.8E-09	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.7E-09	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	1.1E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.5E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	7.1E-08	mg/kg-day	1.6E+00	N/A	1.1E-07
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	5.6E-09	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.6E-08	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.8E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	2.2E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.9E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	4.0E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.2E-09	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	9.9E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										1.1E-07
										Total Risk Across All Exposure Routes/Pathways	2.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	1.5E-06	mg/kg-day	7.3E-01	1/mg/kg/day	1.1E-06
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	1.3E-06	mg/kg-day	7.3E+00	1/mg/kg/day	9.6E-06
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	1.8E-06	mg/kg-day	7.3E-01	1/mg/kg/day	1.3E-06
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	3.2E-07	mg/kg-day	7.3E+00	1/mg/kg/day	2.4E-06
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	5.1E-07	mg/kg-day	7.3E-01	1/mg/kg/day	3.7E-07
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	5.0E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	9.2E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	2.2E-06	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	2.0E-05	mg/kg-day	1.5E+00	1/mg/kg/day	2.9E-05
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	5.0E-06	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	3.1E-05	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	1.6E-04	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	1.9E-02	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.4E-04	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	3.5E-04	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	1.1E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	8.7E-04	mg/kg-day	N/A	N/A	N/A
											4.4E-05

TABLE 8.12.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	9.6E-01	mg/kg	9.6E-01	mg/kg	M	6.6E-07	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	8.4E-01	mg/kg	8.4E-01	mg/kg	M	5.8E-07	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	1.2E+00	mg/kg	1.2E+00	mg/kg	M	8.1E-07	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.1E-01	mg/kg	2.1E-01	mg/kg	M	1.4E-07	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	3.3E-01	mg/kg	3.3E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.2E-01	mg/kg	3.2E-01	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.9E+03	mg/kg	5.9E+03	mg/kg	M	4.1E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	1.4E+00	mg/kg	1.4E+00	mg/kg	M	9.5E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	1.2E+01	mg/kg	1.2E+01	mg/kg	M	2.7E-06	mg/kg-day	1.6E+00	N/A	4.3E-06
	Barium	7.3E+01	mg/kg	7.3E+01	mg/kg	M	5.0E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	3.2E+00	mg/kg	3.2E+00	mg/kg	M	2.2E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	2.0E+01	mg/kg	2.0E+01	mg/kg	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	Copper	1.0E+02	mg/kg	1.0E+02	mg/kg	M	6.9E-06	mg/kg-day	N/A	N/A	N/A
	Iron	1.2E+04	mg/kg	1.2E+04	mg/kg	M	8.6E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	2.2E+02	mg/kg	2.2E+02	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	6.9E-01	mg/kg	6.9E-01	mg/kg	M	4.7E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.5E+02	mg/kg	5.5E+02	mg/kg	M	3.8E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										4.3E-06
										Total Risk Across All Exposure Routes/Pathways	4.8E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.13.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/kg	M	1.5E-05	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.14.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Emissions from Exposed Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Mercury	2.2E+02	mg/kg	5.2E-03	mg/kg	M	8.4E-04	mg/kg-day	N/A	N/A	N/A
	(Total)										0.0E+00
										Total Risk Across All Exposure Routes/Pathways	0.0E+00

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
N/A - not applicable.

TABLE 8.15.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	7.1E-09	mg/kg-day	7.3E-01	1/mg/kg/day	5.2E-09
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	6.7E-09	mg/kg-day	7.3E+00	1/mg/kg/day	4.9E-08
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	8.8E-09	mg/kg-day	7.3E-01	1/mg/kg/day	6.4E-09
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	6.0E-09	mg/kg-day	7.3E+00	1/mg/kg/day	4.4E-08
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	3.5E-09	mg/kg-day	7.3E-01	1/mg/kg/day	2.6E-09
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	9.1E-09	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	1.7E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	2.3E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	2.3E-07	mg/kg-day	1.5E+00	1/mg/kg/day	3.4E-07
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	1.5E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	1.4E-08	mg/kg-day	N/A	N/A	N/A
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	4.7E-07	mg/kg-day	N/A	N/A	N/A
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	9.6E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	3.1E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	1.6E+02	mg/kg	1.6E+02	mg/kg	M	4.9E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	1.4E+02	mg/kg	1.4E+02	mg/kg	M	4.4E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Zinc	5.7E-01	mg/kg	5.7E-01	mg/kg	M	1.7E-08	mg/kg-day	N/A	N/A	N/A
											4.5E-07

TABLE 8.15.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	8.6E-09	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	8.1E-09	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	7.2E-09	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	4.2E-09	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.0E-05	mg/kg-day	N/A	N/A	N/A
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	2.7E-09	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	8.8E-08	mg/kg-day	1.6E+00	N/A	1.4E-07
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	1.8E-07	mg/kg-day	N/A	N/A	N/A
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	1.7E-09	mg/kg-day	N/A	N/A	N/A
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	5.6E-08	mg/kg-day	N/A	N/A	N/A
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.2E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	3.7E-05	mg/kg-day	N/A	N/A	N/A
	Manganese	1.6E+02	mg/kg	1.6E+02	mg/kg	M	5.9E-07	mg/kg-day	N/A	N/A	N/A
	Mercury	1.4E+02	mg/kg	1.4E+02	mg/kg	M	5.2E-07	mg/kg-day	N/A	N/A	N/A
	Thallium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.5E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.1E-09	mg/kg-day	N/A	N/A	N/A
	(Total)										1.4E-07
										Total Risk Across All Exposure Routes/Pathways	5.9E-07

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 8.16.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	6.6E-08	mg/kg-day	1.5E+00	1/mg/kg/day	9.9E-08
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	8.0E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										9.9E-08
Dermal Absorption											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	3.8E-06	mg/kg-day	1.6E+00	1/mg/kg/day	6.0E-06
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	1.4E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										6.0E-06
										Total Risk Across All Exposure Routes/Pathways	6.1E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement.
N/A - not available

TABLE 8.17.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Site Sediment
Receptor Population: Other Recreational Person
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	4.1E-07	mg/kg-day	1.5E+00	1/mg/kg/day	6.2E-07
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	5.0E-07	mg/kg-day	N/A	N/A	N/A
	(Total)										6.2E-07
Dermal Absorption											
	Arsenic	2.0E+01	µg/l	2.0E+01	µg/l	M	3.5E-06	mg/kg-day	1.6E+00	1/mg/kg/day	5.6E-06
	Mercury	2.5E+01	µg/l	2.5E+01	µg/l	M	1.3E-06	mg/kg-day	N/A	N/A	N/A
	(Total)										5.6E-06
										Total Risk Across All Exposure Routes/Pathways	6.2E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal absorption per event calculated in Table 8.6a.RME Supplement.
N/A - not available

TABLE 8.18.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	9.9E-08	mg/kg-day	7.3E-01	1/mg/kg/day	7.2E-08
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	9.3E-08	mg/kg-day	7.3E+00	1/mg/kg/day	6.8E-07
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	1.2E-07	mg/kg-day	7.3E-01	1/mg/kg/day	8.9E-08
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	8.4E-08	mg/kg-day	7.3E+00	1/mg/kg/day	6.1E-07
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	4.9E-08	mg/kg-day	7.3E-01	1/mg/kg/day	3.6E-08
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	1.3E-07	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	2.3E-03	mg/kg-day	N/A	N/A	N/A
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	3.2E-07	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	3.2E-06	mg/kg-day	1.5E+00	1/mg/kg/day	4.8E-06
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	2.1E-05	mg/kg-day	N/A	N/A	N/A
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	2.0E-07	mg/kg-day	N/A	N/A	N/A
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	6.5E-06	mg/kg-day	N/A	N/A	N/A
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	1.3E-05	mg/kg-day	N/A	N/A	N/A
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	4.3E-03	mg/kg-day	N/A	N/A	N/A
	Manganese	1.6E+02	mg/kg	1.6E+02	mg/kg	M	6.8E-05	mg/kg-day	N/A	N/A	N/A
	Mercury	1.4E+02	mg/kg	1.4E+02	mg/kg	M	6.1E-05	mg/kg-day	N/A	N/A	N/A
	Thallium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	1.8E-06	mg/kg-day	N/A	N/A	N/A
	Zinc	5.7E-01	mg/kg	5.7E-01	mg/kg	M	2.4E-07	mg/kg-day	N/A	N/A	N/A
											6.2E-06

TABLE 8.18.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Site Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal Absorption	Benzo(a)anthracene	2.3E-01	mg/kg	2.3E-01	mg/kg	M	4.7E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(a)pyrene	2.2E-01	mg/kg	2.2E-01	mg/kg	M	4.4E-08	mg/kg-day	N/A	N/A	N/A
	Benzo(b)fluoranthene	2.9E-01	mg/kg	2.9E-01	mg/kg	M	5.8E-08	mg/kg-day	N/A	N/A	N/A
	Dibenz(a,h)anthracene	2.0E-01	mg/kg	2.0E-01	mg/kg	M	4.0E-08	mg/kg-day	N/A	N/A	N/A
	Indeno(1,2,3-cd)pyrene	1.2E-01	mg/kg	1.2E-01	mg/kg	M	2.3E-08	mg/kg-day	N/A	N/A	N/A
	2-Amino-4,6-dinitrotoluene	3.0E-01	mg/kg	3.0E-01	mg/kg	M	6.0E-08	mg/kg-day	N/A	N/A	N/A
	Aluminum	5.5E+03	mg/kg	5.5E+03	mg/kg	M	1.1E-04	mg/kg-day	N/A	N/A	N/A
	Antimony	7.5E-01	mg/kg	7.5E-01	mg/kg	M	1.5E-08	mg/kg-day	N/A	N/A	N/A
	Arsenic	7.5E+00	mg/kg	7.5E+00	mg/kg	M	4.8E-07	mg/kg-day	1.6E+00	N/A	7.6E-07
	Barium	4.9E+01	mg/kg	4.9E+01	mg/kg	M	1.0E-06	mg/kg-day	N/A	N/A	N/A
	Cadmium	4.7E-01	mg/kg	4.7E-01	mg/kg	M	9.5E-09	mg/kg-day	N/A	N/A	N/A
	Chromium	1.5E+01	mg/kg	1.5E+01	mg/kg	M	3.1E-07	mg/kg-day	N/A	N/A	N/A
	Copper	3.2E+01	mg/kg	3.2E+01	mg/kg	M	6.4E-07	mg/kg-day	N/A	N/A	N/A
	Iron	1.0E+04	mg/kg	1.0E+04	mg/kg	M	2.0E-04	mg/kg-day	N/A	N/A	N/A
	Manganese	1.6E+02	mg/kg	1.6E+02	mg/kg	M	3.2E-06	mg/kg-day	N/A	N/A	N/A
	Mercury	1.4E+02	mg/kg	1.4E+02	mg/kg	M	2.9E-06	mg/kg-day	N/A	N/A	N/A
	Thallium	4.2E+00	mg/kg	4.2E+00	mg/kg	M	8.4E-08	mg/kg-day	N/A	N/A	N/A
	Zinc	5.7E-01	mg/kg	5.7E-01	mg/kg	M	1.1E-08	mg/kg-day	N/A	N/A	N/A
	(Total)										7.6E-07
										Total Risk Across All Exposure Routes/Pathways	7.0E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.
Skin absorption factor from EPA, 1995, Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003. Skin absorption factor is 10% for SVOCs, 3.2% for arsenic, and 1% for all other inorganics. Assumed 10% absorption factor for explosives based on professional judgement and the skin absorption factors for SVOCs and Pesticides/PCBs.
N/A - not applicable.

TABLE 9.1 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	2.4E-07	N/A	N/A	2.4E-07	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	2.1E-06	N/A	N/A	2.1E-06	Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	3.0E-07	N/A	N/A	3.0E-07	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
			Dibenz(a,h)anthracene	5.3E-07	N/A	N/A	5.3E-07	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	8.3E-08	N/A	N/A	8.3E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	N/A	2-Amino-4,6-dinitrotoluene	N/A	0.005	N/A	0.01	0.02
			Aluminum	N/A	N/A	N/A	N/A	Aluminum	CNS	0.006	N/A	0.004	0.009
			Antimony	N/A	N/A	N/A	N/A	Antimony	Blood	0.003	N/A	0.006	0.01
			Arsenic	6.5E-06	N/A	3.7E-06	1.0E-05	Arsenic	Skin/vascular	0.04	N/A	0.02	0.06
			Barium	N/A	N/A	N/A	N/A	Barium	Kidney	0.001	N/A	0.0002	0.001
			Cadmium	N/A	N/A	N/A	N/A	Cadmium	Kidney	0.003	N/A	0.02	0.02
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.007	N/A	0.1	0.1
			Copper	N/A	N/A	N/A	N/A	Copper	Gastrointestinal	0.002	N/A	0.0007	0.003
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.04	N/A	0.03	0.07
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.01	N/A	0.005	0.02
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.7	N/A	0.1	0.9
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.010	N/A	0.002	0.01
			Zinc	N/A	N/A	N/A	N/A	Zinc	Blood	0.002	N/A	0.001	0.003
			(Total)	9.8E-06	NA	3.7E-06	1.4E-05	(Total)		0.9	N/A	0.3	1.2
			Total Risk Across Surface Soil				1.4E-05	Total Hazard Index Across Surface Soil					1.2
Surface Soil	Air	Emissions from Exposed Surface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	1.1	N/A	1.1
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	1.1	N/A	1.1
			Total Risk Across Emissions from Exposed Surface Soil				N/A	Total Hazard Index Across Emissions from Exposed Surface Soil					1.1
			Total Risk Across All Media and All Exposure Routes				1.4E-05	Total Hazard Index Across All Media and All Exposure Routes					2.3

Total CNS HI =	1.2
Total Blood HI =	0.01
Total Skin HI =	0.08
Total Vascular HI =	0.08
Total Kidney HI -=	0.03
Total NOAEL HI =	0.1
Total Gastrointestinal HI =	0.08
Total Immune System HI =	0.9

TABLE 9.2 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	4.9E-08	N/A	N/A	4.9E-08	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	4.3E-07	N/A	N/A	4.3E-07	Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	6.0E-08	N/A	N/A	6.0E-08	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
			Dibenz(a,h)anthracene	1.1E-07	N/A	N/A	1.1E-07	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	1.7E-08	N/A	N/A	1.7E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	N/A	2-Amino-4,6-dinitrotoluene	N/A	0.001	N/A	0.0008	0.002
			Aluminum	N/A	N/A	N/A	N/A	Aluminum	CNS	0.001	N/A	0.0003	0.001
			Antimony	N/A	N/A	N/A	N/A	Antimony	Blood	0.0007	N/A	0.0004	0.001
			Arsenic	1.3E-06	N/A	2.6E-07	1.6E-06	Arsenic	Skin/vascular	0.008	N/A	0.002	0.01
			Barium	N/A	N/A	N/A	N/A	Barium	Kidney	0.0002	N/A	0.00001	0.0002
			Cadmium	N/A	N/A	N/A	N/A	Cadmium	Kidney	0.0006	N/A	0.002	0.002
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.001	N/A	0.008	0.009
			Copper	N/A	N/A	N/A	N/A	Copper	Gastrointestinal	0.0005	N/A	0.00005	0.0006
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.008	N/A	0.002	0.01
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.002	N/A	0.0004	0.003
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.2	N/A	0.009	0.2
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.002	N/A	0.0001	0.002
			Zinc	N/A	N/A	N/A	N/A	Zinc	Blood	0.0004	N/A	0.00009	0.0005
			(Total)	2.0E-06	NA	2.6E-07	2.2E-06	(Total)		0.2	N/A	0.02	0.2
			Total Risk Across Surface Soil				2.2E-06	Total Hazard Index Across Surface Soil					0.2
Surface Soil	Air	Emissions from Exposed Surface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.05	N/A	0.05
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.05	N/A	0.05
			Total Risk Across Emissions from Exposed Surface Soil				N/A	Total Hazard Index Across Emissions from Exposed Surface Soil					0.05
			Total Risk Across All Media and All Exposure Routes				2.2E-06	Total Hazard Index Across All Media and All Exposure Routes					0.3

Total CNS HI =	0.06
Total Blood HI =	0.002
Total Skin HI =	0.01
Total Vascular HI =	0.01
Total Kidney HI -=	0.002
Total NOAEL HI =	0.009
Total Gastrointestinal HI =	0.01
Total Immune System HI =	0.2

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescents

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	3.5E-08	N/A	N/A	3.5E-08	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	3.0E-07	N/A	N/A	3.0E-07	Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	4.2E-08	N/A	N/A	4.2E-08	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
			Dibenz(a,h)anthracene	7.5E-08	N/A	N/A	7.5E-08	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	1.2E-08	N/A	N/A	1.2E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	N/A	2-Amino-4,6-dinitrotoluene	N/A	0.0002	N/A	0.001	0.002
			Aluminum	N/A	N/A	N/A	N/A	Aluminum	CNS	0.0002	N/A	0.0004	0.0007
			Antimony	N/A	N/A	N/A	N/A	Antimony	Blood	0.0001	N/A	0.0007	0.0008
			Arsenic	9.3E-07	N/A	8.3E-08	1.0E-06	Arsenic	Skin/vascular	0.002	N/A	0.003	0.004
			Barium	N/A	N/A	N/A	N/A	Barium	Kidney	0.00004	N/A	0.00002	0.00006
			Cadmium	N/A	N/A	N/A	N/A	Cadmium	Kidney	0.0001	N/A	0.002	0.003
			Chromium	N/A	N/A	N/A	N/A	Chromium	NOAEL	0.0003	N/A	0.01	0.01
			Copper	N/A	N/A	N/A	N/A	Copper	Gastrointestinal	0.0001	N/A	0.00008	0.0002
			Iron	N/A	N/A	N/A	N/A	Iron	Gastrointestinal	0.002	N/A	0.004	0.006
			Manganese	N/A	N/A	N/A	N/A	Manganese	CNS	0.0004	N/A	0.0006	0.001
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.03	N/A	0.01	0.04
			Thallium	N/A	N/A	N/A	N/A	Thallium	Skin/vascular	0.0004	N/A	0.0002	0.0006
			Zinc	N/A	N/A	N/A	N/A	Zinc	Blood	0.00007	N/A	0.0001	0.0002
			(Total)	1.4E-06	NA	8.3E-08	1.5E-06	(Total)		0.03	N/A	0.04	0.07
			Total Risk Across Surface Soil				1.5E-06	Total Hazard Index Across Surface Soil					0.07
Surface Soil	Air	Emissions from Exposed Surface Soil	Mercury	N/A	N/A	N/A	N/A	Mercury	CNS	N/A	0.1	N/A	0.1
			(Total)	N/A	N/A	N/A	0.0E+00	(Total)		N/A	0.1	N/A	0.1
			Total Risk Across Emissions from Exposed Surface Soil				N/A	Total Hazard Index Across Emissions from Exposed Surface Soil					0.1
			Total Risk Across All Media and All Exposure Routes				1.5E-06	Total Hazard Index Across All Media and All Exposure Routes					0.2

Total CNS HI =	0.1
Total Blood HI =	0.001
Total Skin HI =	0.005
Total Vascular HI =	0.005
Total Kidney HI -=	0.003
Total NOAEL HI =	0.01
Total Gastrointestinal HI =	0.006
Total Immune System HI =	0.04

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	1.1E-06	N/A	1.3E-04	1.3E-04	Arsenic	Skin/vascular	0.007	N/A	9	9
			Mercury	N/A	N/A	N/A	0.0E+00	Mercury	Immune System	0.008	N/A	0.3	0.3
			(Total)	1.1E-06	NA	1.3E-04	1.3E-04	(Total)		0.02	N/A	9	9
			Total Risk Across Sediment				1.3E-04	Total Hazard Index Across Sediment					9
Surface Water	Surface Water	Site Surface Water	Arsenic	1.3E-06	N/A	6.4E-06	7.7E-06	Arsenic	Skin/vascular	0.0003	N/A	0.0002	0.0005
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	CNS	0.01	N/A	0.3	0.3
			(Total)	1.3E-06	NA	6.4E-06	7.7E-06	(Total)		0.01	N/A	0.3	0.3
			Total Risk Across Surface Water				7.7E-06	Total Hazard Index Across Surface Water					0.3
Total Risk Across All Media and All Exposure Routes							1.4E-04	Total Hazard Index Across All Media and All Exposure Routes					9

Total CNS HI =	0.3
Total Skin HI =	9
Total Vascular HI =	9
Total Immune System HI =	0.3

TABLE 9.5 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	2.5E-06	N/A	4.6E-05	4.9E-05	Arsenic	Skin/vascular	0.06	N/A	12	12
			Mercury	N/A	N/A	N/A	0.0E+00	Mercury	Immune System	0.08	N/A	0.4	0.5
			(Total)	2.5E-06	NA	4.6E-05	4.9E-05	(Total)		0.1	N/A	12	13
			Total Risk Across Sediment				4.9E-05	Total Hazard Index Across Sediment					13
Surface Water	Surface Water	Site Surface Water	Arsenic	7.5E-06	N/A	2.2E-06	9.7E-06	Arsenic	Skin/vascular	0.006	N/A	0.0002	0.007
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	CNS	0.2	N/A	0.4	0.6
			(Total)	7.5E-06	NA	2.2E-06	9.7E-06	(Total)		0.2	N/A	0.4	0.6
			Total Risk Across Surface Soil				9.7E-06	Total Hazard Index Across Surface Soil					0.6
Total Risk Across All Media and All Exposure Routes							5.9E-05	Total Hazard Index Across All Media and All Exposure Routes					13

Total CNS HI =	0.6
Total Skin HI =	12
Total Vascular HI =	12
Total Immune System HI =	0.5

TABLE 9.6 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	4.7E-08	N/A	N/A	4.7E-08	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	4.1E-07	N/A	N/A	4.1E-07	Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	5.7E-08	N/A	N/A	5.7E-08	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
			Dibenz(a,h)anthracene	1.0E-07	N/A	N/A	1.0E-07	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	1.6E-08	N/A	N/A	1.6E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	0.0E+00	2-Amino-4,6-dinitrotoluene	N/A	0.03	N/A	0.008	0.03
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	CNS	0.03	N/A	0.003	0.03
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	0.02	N/A	0.004	0.02
			Arsenic	1.3E-06	N/A	1.1E-07	1.4E-06	Arsenic	Skin/vascular	0.2	N/A	0.02	0.2
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney	0.00	N/A	0.0001	0.005
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	0.01	N/A	0.02	0.03
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	NOAEL	0.005	N/A	0.08	0.09
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	0.01	N/A	0.0005	0.01
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	0.2	N/A	0.03	0.2
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	CNS	0.05	N/A	0.004	0.06
			Mercury	N/A	N/A	N/A	0.0E+00	Mercury	Immune System	3	N/A	0.09	4
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin/vascular	0.05	N/A	0.001	0.05
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	0.01	N/A	0.001	0.01
			(Total)	1.9E-06	NA	1.1E-07	2.0E-06	(Total)		4	N/A	0.3	4
			Total Risk Across Surface Soil				2.0E-06	Total Hazard Index Across Surface Soil					4
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	3	N/A	3
								(Total)		N/A	3	N/A	3
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					3
			Total Risk Across All Media and All Exposure Routes				2.0E-06	Total Hazard Index Across All Media and All Exposure Routes					8

Total CNS HI =	3.5
Total Blood HI =	0.03
Total Skin HI =	0.3
Total Vascular HI =	0.3
Total Kidney HI -=	0.04
Total NOAEL HI =	0.09
Total Gastrointestinal HI =	0.2
Total Immune System HI =	4

TABLE 9.7 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
								Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
								Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
								Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
								Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
								2-Amino-4,6-dinitrotoluene	N/A	0.007	N/A	0.01	0.02
								Aluminum	CNS	0.008	N/A	0.003	0.01
								Antimony	Blood	0.005	N/A	0.005	0.01
								Arsenic	Skin/vascular	0.06	N/A	0.02	0.08
								Barium	Kidney	0.001	N/A	0.0002	0.002
								Cadmium	Kidney	0.004	N/A	0.02	0.02
								Chromium	NOAEL	0.009	N/A	0.1	0.1
								Copper	Gastrointestinal	0.003	N/A	0.0007	0.004
								Iron	Gastrointestinal	0.06	N/A	0.03	0.09
								Manganese	CNS	0.02	N/A	0.005	0.02
								Mercury	Immune System	1.0	N/A	0.1	1
								Thallium	Skin/vascular	0.01	N/A	0.002	0.02
								Zinc	Blood	0.003	N/A	0.001	0.004
			(Total)					(Total)		1	N/A	0.3	2
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					2
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	5	N/A	5
								(Total)		N/A	5	N/A	5
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					5
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					6

Total CNS HI =	5
Total Blood HI =	0.01
Total Skin HI =	0.09
Total Vascular HI =	0.09
Total Kidney HI -=	0.03
Total NOAEL HI =	0.1
Total Gastrointestinal HI =	0.09
Total Immune System HI =	1

TABLE 9.8 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
								Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
								Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
								Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
								Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
								2-Amino-4,6-dinitrotoluene	N/A	0.07	N/A	0.01	0.08
								Aluminum	CNS	0.08	N/A	0.004	0.08
								Antimony	Blood	0.04	N/A	0.006	0.05
								Arsenic	Skin/vascular	0.5	N/A	0.02	0.6
								Barium	Kidney	0.01	N/A	0.0002	0.01
								Cadmium	Kidney	0.04	N/A	0.02	0.06
								Chromium	NOAEL	0.09	N/A	0.1	0.2
								Copper	Gastrointestinal	0.03	N/A	0.0007	0.03
								Iron	Gastrointestinal	0.5	N/A	0.03	0.6
								Manganese	CNS	0.1	N/A	0.005	0.1
								Mercury	Immune System	10	N/A	0.1	10
								Thallium	Skin/vascular	0.1	N/A	0.002	0.1
								Zinc	Blood	0.02	N/A	0.001	0.02
			(Total)					(Total)		11	N/A	0.3	12
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					12
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	13	N/A	13
								(Total)		N/A	13	N/A	13
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					13
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					25

Total CNS HI =	14
Total Blood HI =	0.07
Total Skin HI =	0.7
Total Vascular HI =	0.7
Total Kidney HI -=	0.08
Total NOAEL HI =	0.2
Total Gastrointestinal HI =	0.6
Total Immune System HI =	10

TABLE 9.9 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	1.1E-06	N/A	N/A	1.1E-06						
			Benzo(a)pyrene	9.6E-06	N/A	N/A	9.6E-06						
			Benzo(b)fluoranthene	1.3E-06	N/A	N/A	1.3E-06						
			Dibenz(a,h)anthracene	2.4E-06	N/A	N/A	2.4E-06						
			Indeno(1,2,3-cd)pyrene	3.7E-07	N/A	N/A	3.7E-07						
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	N/A						
			Aluminum	N/A	N/A	N/A	N/A						
			Antimony	N/A	N/A	N/A	N/A						
			Arsenic	2.9E-05	N/A	4.3E-06	3.4E-05						
			Barium	N/A	N/A	N/A	N/A						
			Cadmium	N/A	N/A	N/A	N/A						
			Chromium	N/A	N/A	N/A	N/A						
			Copper	N/A	N/A	N/A	N/A						
			Iron	N/A	N/A	N/A	N/A						
			Manganese	N/A	N/A	N/A	N/A						
			Mercury	N/A	N/A	N/A	N/A						
			Thallium	N/A	N/A	N/A	N/A						
			Zinc	N/A	N/A	N/A	N/A						
			(Total)	4.4E-05	N/A	4.3E-06	4.8E-05	(Total)					0
			Total Risk Across Surface Soil				4.8E-05	Total Hazard Index Across Surface Soil					0
Surface Soil	Air	Emissions from Exposed Surface Soil	Mercury	N/A	N/A	N/A	0E+00						
				0E+00	0E+00	0E+00	0.0E+00						
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					0
			Total Risk Across All Media and All Exposure Routes				4.8E-05	Total Hazard Index Across All Media and All Exposure Routes					0

TABLE 9.10 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	5.2E-09	N/A	N/A	5.2E-09	Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
			Benzo(a)pyrene	4.9E-08	N/A	N/A	4.9E-08	Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
			Benzo(b)fluoranthene	6.4E-09	N/A	N/A	6.4E-09	Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
			Dibenz(a,h)anthracene	4.4E-08	N/A	N/A	4.4E-08	Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
			Indeno(1,2,3-cd)pyrene	2.6E-09	N/A	N/A	2.6E-09	Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	0.0E+00	2-Amino-4,6-dinitrotoluene	N/A	0.002	N/A	0.003	0.01
			Aluminum	N/A	N/A	N/A	0.0E+00	Aluminum	CNS	0.002	N/A	0.001	0.003
			Antimony	N/A	N/A	N/A	0.0E+00	Antimony	Blood	0.0008	N/A	0.001	0.002
			Arsenic	3.4E-07	N/A	1.4E-07	4.8E-07	Arsenic	Skin/vascular	0.01	N/A	0.004	0.01
			Barium	N/A	N/A	N/A	0.0E+00	Barium	Kidney	0.0003	N/A	0.00004	0.0003
			Cadmium	N/A	N/A	N/A	0.0E+00	Cadmium	Kidney	0.0002	N/A	0.001	0.001
			Chromium	N/A	N/A	N/A	0.0E+00	Chromium	NOAEL	0.002	N/A	0.03	0.03
			Copper	N/A	N/A	N/A	0.0E+00	Copper	Gastrointestinal	0.0003	N/A	0.0001	0.0004
			Iron	N/A	N/A	N/A	0.0E+00	Iron	Gastrointestinal	0.01	N/A	0.009	0.02
			Manganese	N/A	N/A	N/A	0.0E+00	Manganese	CNS	0.003	N/A	0.001	0.004
			Mercury	N/A	N/A	N/A	0.0E+00	Mercury	Immune System	0.01	N/A	0.001	0.01
			Thallium	N/A	N/A	N/A	0.0E+00	Thallium	Skin/vascular	0.003	N/A	0.0004	0.004
			Zinc	N/A	N/A	N/A	0.0E+00	Zinc	Blood	0.0003	N/A	0.0001	0.0004
			(Total)	4.5E-07	NA	1.4E-07	5.9E-07	(Total)		0.05	N/A	0.05	0.09
			Total Risk Across Surface Soil				5.9E-07	Total Hazard Index Across Surface Soil					0.09
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	0.006	N/A	0.006
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					0.09
			Total Risk Across All Media and All Exposure Routes				5.9E-07	Total Hazard Index Across All Media and All Exposure Routes					0.1

Total CNS HI =	0.01
Total Blood HI =	0.002
Total Skin HI =	0.02
Total Vascular HI =	0.02
Total Kidney HI -=	0.002
Total NOAEL HI =	0.03
Total Gastrointestinal HI =	0.0235
Total Immune System HI =	0.007

TABLE 9.11 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	9.9E-08	N/A	6.0E-06	6.1E-06	Arsenic	Skin/vascular	0.001	N/A	0.6	0.6
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.002	N/A	0.03	0.03
			(Total)	9.9E-08	NA	6.0E-06	6.1E-06	(Total)		0.003	N/A	0.6	0.6
			Total Risk Across Sediment				6.1E-06	Total Hazard Index Across Sediment					0.6
Total Risk Across All Media and All Exposure Routes							6.1E-06	Total Hazard Index Across All Media and All Exposure Routes					0.6

Total Skin HI =	0.6
Total Vascular HI =	0.6
Total Immune System HI =	0.03

TABLE 9.12 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	6.2E-07	N/A	5.6E-06	6.2E-06	Arsenic	Skin/vascular	0.005	N/A	0.9	0.9
			Mercury	N/A	N/A	N/A	N/A	Mercury	Immune System	0.009	N/A	0.05	0.05
			(Total)	6.2E-07	NA	5.6E-06	6.2E-06	(Total)		0.01	N/A	0.9	0.9
			Total Risk Across Sediment				6.2E-06	Total Hazard Index Across Sediment					0.9
Total Risk Across All Media and All Exposure Routes							6.2E-06	Total Hazard Index Across All Media and All Exposure Routes					0.9

Total Skin HI =	0.9
Total Vascular HI =	0.9
Total Immune System HI =	0.05

TABLE 9.13 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
								Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
								Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
								Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
								Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
								2-Amino-4,6-dinitrotoluene	N/A	0.004	N/A	0.002	0.006
								Aluminum	CNS	0.005	N/A	0.0006	0.005
								Antimony	Blood	0.002	N/A	0.0006	0.002
								Arsenic	Skin/vascular	0.02	N/A	0.003	0.02
								Barium	Kidney	0.0006	N/A	0.00002	0.0006
								Cadmium	Kidney	0.0004	N/A	0.0006	0.001
								Chromium	NOAEL	0.0007	N/A	0.02	0.02
								Copper	Gastrointestinal	0.0007	N/A	0.00004	0.0007
								Iron	Gastrointestinal	0.03	N/A	0.005	0.03
								Manganese	CNS	0.006	N/A	0.001	0.007
								Mercury	Immune System	0.01	N/A	0.0004	0.01
								Thallium	Skin/vascular	0.007	N/A	0.0002	0.007
								Zinc	Blood	0.0005	N/A	0.00007	0.0006
			(Total)				0E+00	(Total)		0.09	N/A	0.03	0.12
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					0.12
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	0.02	N/A	0.02
								(Total)		N/A	0.02	N/A	0.02
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					0.02
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					0.13

Total CNS HI =	0.03
Total Blood HI =	0.003
Total Skin HI =	0.03
Total Vascular HI =	0.03
Total Kidney HI -=	0.002
Total NOAEL HI =	0.02
Total Gastrointestinal HI =	0.0348
Total Immune System HI =	0.01

TABLE 9.14 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
								Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
								Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
								Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
								Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
								2-Amino-4,6-dinitrotoluene	N/A	0.002	N/A	0.01	0.01
								Aluminum	CNS	0.003	N/A	0.002	0.004
								Antimony	Blood	0.001	N/A	0.002	0.003
								Arsenic	Skin/vascular	0.01	N/A	0.008	0.02
								Barium	Kidney	0.0003	N/A	0.0001	0.0004
								Cadmium	Kidney	0.0002	N/A	0.002	0.002
								Chromium	NOAEL	0.002	N/A	0.05	0.05
								Copper	Gastrointestinal	0.0004	N/A	0.0001	0.0005
								Iron	Gastrointestinal	0.02	N/A	0.02	0.03
								Manganese	CNS	0.003	N/A	0.002	0.005
								Mercury	Immune System	0.006	N/A	0.001	0.008
								Thallium	Skin/vascular	0.004	N/A	0.0007	0.004
								Zinc	Blood	0.0003	N/A	0.0002	0.0005
			(Total)					(Total)		0.05	N/A	0.09	0.1
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					0.1
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	0.06	N/A	0.06
								(Total)		N/A	0.06	N/A	0.06
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					0.06
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					0.2

Total CNS HI =	0.069
Total Blood HI =	0.003
Total Skin HI =	0.02
Total Vascular HI =	0.02
Total Kidney HI -=	0.002
Total NOAEL HI =	0.05
Total Gastrointestinal HI =	0.03
Total Immune System HI =	0.008

TABLE 9.15 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A
								Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A
								Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A
								Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A
								Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A
								2-Amino-4,6-dinitrotoluene	N/A	0.02	N/A	0.01	0.03
								Aluminum	CNS	0.02	N/A	0.002	0.03
								Antimony	Blood	0.008	N/A	0.002	0.01
								Arsenic	Skin/vascular	0.1	N/A	0.008	0.1
								Barium	Kidney	0.003	N/A	0.00007	0.003
								Cadmium	Kidney	0.002	N/A	0.002	0.004
								Chromium	NOAEL	0.02	N/A	0.05	0.07
								Copper	Gastrointestinal	0.003	N/A	0.0001	0.003
								Iron	Gastrointestinal	0.1	N/A	0.02	0.2
								Manganese	CNS	0.03	N/A	0.002	0.03
								Mercury	Immune System	0.06	N/A	0.001	0.06
								Thallium	Skin/vascular	0.03	N/A	0.0008	0.04
								Zinc	Blood	0.003	N/A	0.0002	0.003
			(Total)					(Total)		0.5	N/A	0.09	0.6
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					0.6
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	0.2	N/A	0.2
								(Total)		N/A	0.2	N/A	0.2
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					0.2
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					0.7

Total CNS HI =	0.2
Total Blood HI =	0.01
Total Skin HI =	0.1
Total Vascular HI =	0.1
Total Kidney HI -=	0.007
Total NOAEL HI =	0.07
Total Gastrointestinal HI =	0.2
Total Immune System HI =	0.06

TABLE 9.16 CT
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil	Benzo(a)anthracene	7.2E-08	N/A	N/A	7.2E-08						
			Benzo(a)pyrene	6.8E-07	N/A	N/A	6.8E-07						
			Benzo(b)fluoranthene	8.9E-08	N/A	N/A	8.9E-08						
			Dibenz(a,h)anthracene	6.1E-07	N/A	N/A	6.1E-07						
			Indeno(1,2,3-cd)pyrene	3.6E-08	N/A	N/A	3.6E-08						
			2-Amino-4,6-dinitrotoluene	N/A	N/A	N/A	N/A						
			Aluminum	N/A	N/A	N/A	N/A						
			Antimony	N/A	N/A	N/A	N/A						
			Arsenic	4.8E-06	N/A	7.6E-07	5.5E-06						
			Barium	N/A	N/A	N/A	N/A						
			Cadmium	N/A	N/A	N/A	N/A						
			Chromium	N/A	N/A	N/A	N/A						
			Copper	N/A	N/A	N/A	N/A						
			Iron	N/A	N/A	N/A	N/A						
			Manganese	N/A	N/A	N/A	N/A						
			Mercury	N/A	N/A	N/A	N/A						
			Thallium	N/A	N/A	N/A	N/A						
			Zinc	N/A	N/A	N/A	N/A						
			(Total)	6.2E-06	N/A	7.6E-07	7.0E-06	(Total)					0
			Total Risk Across Surface Soil				7.0E-06	Total Hazard Index Across Surface Soil					0
			Total Risk Across All Media and All Exposure Routes				7.0E-06	Total Hazard Index Across All Media and All Exposure Routes					0

TABLE 10.1 RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Mercury	Immune System	0.7	N/A	0.1	0.9
			(Total)	0.0E+00	NA	0.0E+00	0.0E+00	(Total)		0.7	N/A	0.1	0.9
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					0.9
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	1.1	N/A	1.1
								(Total)		N/A	1.1	N/A	1.1
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					1.1
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					2.0

Total CNS HI = 1.1
Total Immune System HI = 0.9

TABLE 10.2 RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment	Arsenic	1.1E-06	N/A	1.3E-04	1.3E-04	Arsenic	Skin/vascular	0.007	N/A	9	9
			(Total)	1.1E-06	NA	1.3E-04	1.3E-04	(Total)		0.01	N/A	9	9
			Total Risk Across Sediment				1.3E-04	Total Hazard Index Across Sediment					9
Total Risk Across All Media and All Exposure Routes							1.3E-04	Total Hazard Index Across All Media and All Exposure Routes					9

Total Skin HI =	9
Total Vascular HI =	9

TABLE 10.3 RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Site Sediment						Arsenic	Skin/vascular	0.06	N/A	12	12
								Mercury	Immune System	0.08	N/A	0.4	0.5
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		0.1	N/A	12	13
			Total Risk Across Sediment				0.0E+00	Total Hazard Index Across Sediment					13
Total Risk Across All Media and All Exposure Routes							0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					13

Total Skin HI =	12
Total Vascular HI =	12
Total Immune System HI =	0.5

TABLE 10.4 RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Mercury	Immune System	3	N/A	0.09	4
			(Total)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	(Total)		3	N/A	0.1	4
			Total Risk Across Surface Soil				0.0E+00	Total Hazard Index Across Surface Soil					4
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	3	N/A	3
								(Total)		N/A	3	N/A	3
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					3
			Total Risk Across All Media and All Exposure Routes				0.0E+00	Total Hazard Index Across All Media and All Exposure Routes					7

Total CNS HI =	3
Total Immune System HI =	4

TABLE 10.5 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Mercury	Immune System	1.0	N/A	0.1	1
			(Total)					(Total)		1	N/A	0.1	1
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					1
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	5	N/A	5
								(Total)		N/A	5	N/A	5
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					5
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					6

Total CNS HI =	5
Total Immune System HI =	1

TABLE 10.6 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Sites 49, 50, 54, and 55 - Lab Area Surface Soil and Wetland Area
Lab Area, Naval District Washington, Indian Head

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site Surface Soil						Arsenic	Skin/vascular	0.5	N/A	0.02	0.6
								Iron	Gastrointestinal	0.5	N/A	0.03	0.6
								Mercury	Immune System	10	N/A	0.1	10
			(Total)					(Total)		11	N/A	0.2	11
			Total Risk Across Surface Soil				0E+00	Total Hazard Index Across Surface Soil					11
Surface Soil	Air	Emissions from Exposed Surface Soil						Mercury	CNS	N/A	13	N/A	13
								(Total)		N/A	13	N/A	13
			Total Risk Across Emissions from Exposed Surface Soil				0.0E+00	Total Hazard Index Across Emissions from Exposed Surface Soil					13
			Total Risk Across All Media and All Exposure Routes				0E+00	Total Hazard Index Across All Media and All Exposure Routes					24

Total CNS HI =	13
Total Skin HI =	0.6
Total Vascular HI =	0.6
Total Gastrointestinal HI =	0.6
Total Immune System HI =	10

Appendix J
Human-Health Risk Assessment
Lead Model

Table J-1

LEAD MODEL FOR WINDOWS Version 1.0

==========
Model Version: 1.0
User Name: Rwarren
Date: 06/06/02
Site Name: Indian Head, Lab Area, Surface Soil and Wetland Area - Surface Soil
Operable Unit:
Run Mode: Research
==========
The time step used in this model run: 3 - Hourly (24 times a day).

******Air******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc ug Pb/m^3
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******Diet******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

******Drinking Water******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

******Soil& Dust******

Multiple Source Analysis Used
Average multiple source concentration: 122.700 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	161.000	122.700
1-2	161.000	122.700
2-3	161.000	122.700
3-4	161.000	122.700
4-5	161.000	122.700
5-6	161.000	122.700
6-7	161.000	122.700

******Alternate Intake******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

******Maternal Contribution: Infant Model******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
. 5-1	0.021	2.574	0.000	0.372
1-2	0.034	2.674	0.000	0.925
2-3	0.062	3.028	0.000	0.970
3-4	0.067	2.941	0.000	0.999
4-5	0.067	2.877	0.000	1.053
5-6	0.093	3.052	0.000	1.117
6-7	0.093	3.378	0.000	1.139

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	3.322	6.290	3.4
1-2	5.243	8.877	3.7
2-3	5.288	9.348	3.5
3-4	5.342	9.349	3.3
4-5	4.019	8.016	2.8
5-6	3.638	7.900	2.5
6-7	3.444	8.055	2.3

Table J-2

LEAD MODEL FOR WINDOWS Version 1.0

==========
Model Version: 1.0 Build 253
User Name: Stannard
Date: 3/21/2003
Site Name: Indian Head Lab Area
Operable Unit: NA
Run Mode: Site Risk Assessment

Soil/Dust Data
mean normal
Run the Model
mean normal
Soil/Dust Data
mean normal
Run the Model
mean normal
Run the Model
mean normal
==========
The time step used in this model run: 3 - Hourly (24 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500

2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 2041.400 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	2902.000	2041.400
1-2	2902.000	2041.400
2-3	2902.000	2041.400
3-4	2902.000	2041.400
4-5	2902.000	2041.400
5-6	2902.000	2041.400
6-7	2902.000	2041.400

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	1.712	0.000	0.248
1-2	0.034	1.678	0.000	0.581
2-3	0.062	1.986	0.000	0.637
3-4	0.067	2.008	0.000	0.682
4-5	0.067	2.182	0.000	0.799
5-6	0.093	2.420	0.000	0.886
6-7	0.093	2.748	0.000	0.926

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	38.338	40.318	20.4

1-2	57.105	59.398	23.4
2-3	60.211	62.897	22.3
3-4	63.304	66.060	21.9
4-5	52.896	55.943	19.0
5-6	50.057	53.456	16.5
6-7	48.621	52.388	14.7

Table J-3

LEAD MODEL FOR WINDOWS Version 1.0

==========
Model Version: 1.0
User Name: RWarren
Date: 06/06/2
Site Name: Indian Head, Lab Area, Underground Sewer Lines - Subsurface Soil
Operable Unit:
Run Mode: Research
==========
The time step used in this model run: 3 - Hourly (24 times a day).

******Air******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc ug Pb/m^3
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

******Diet******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

******Drinking Water******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

******Soil& Dust******

Multiple Source Analysis Used
Average multiple source concentration: 20.010 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	14.300	20.010
1-2	14.300	20.010
2-3	14.300	20.010
3-4	14.300	20.010
4-5	14.300	20.010
5-6	14.300	20.010
6-7	14.300	20.010

******Alternate Intake******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

******Maternal Contribution: Infant Model******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
. 5-1	0.021	2.658	0.000	0.385
1-2	0.034	2.781	0.000	0.962
2-3	0.062	3.131	0.000	1.004
3-4	0.067	3.028	0.000	1.029
4-5	0.067	2.932	0.000	1.073
5-6	0.093	3.099	0.000	1.134
6-7	0.093	3.423	0.000	1.154

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	0.428	3.492	1.9
1-2	0.680	4.457	1.9
2-3	0.682	4.878	1.8
3-4	0.685	4.809	1.7
4-5	0.510	4.582	1.6
5-6	0.460	4.787	1.5
6-7	0.435	5.105	1.4

Table J-4
Adult Lead Model
Lead Risk-based Concentration for the Adult - Industrial Worker
Lab Area, Naval District Washington, Indian Head

$$PbB_{adult,\ central} = PbB_{fetal,\ 0.95,goal} / ((GSD^{\wedge}1.645) * R)$$

$$PbS = ((PbB_{adult,\ central} - PbB_{adult,0}) * AT) / (BKSF * IR * AF * EF)$$

Exposure Parameter	Description	Industrial Adult Values	Source[1]
PbS	Soil Lead Concentration expressed in ug/g;	1,113	Calc.
$PbB_{adult,central}$	Central estimate of Blood Lead Concentrations in adults exposed to the site expressed in ug/dl;	3.55	Calc.
$PbB_{fetal,0.95,goal}$	Goal for 95th % blood lead concentration (ug/dl);	10	A
GSD	Geometric standard deviation (dimensionless);	2.0	A
R	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (dimensionless);	0.9	A
$PbB_{adult,0}$	Typical Blood Lead Concentration in the absence of exposure to the site expressed in ug/dL;	2.0	A
AT	Averaging Time (days/year)	365	A
BKSF	Biokinetic Slope Factor expressed in ug/dL blood lead increase per ug/day lead uptake;	0.4	A
IR	Intake rate of soil (g/day);	0.05	A
AF	Gastrointestinal absorption fraction for ingested lead in soil and lead in dust from soil (dimensionless)	0.12	A
EF	Exposure frequency (days/year)	219	A

A - EPA, December 1996. *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil.*

Table J-5
Calculations of Blood Lead Concentrations (PbBs)
Lab Area, Naval District Washington, Indian Head
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 2/19/03

Exposure Variable	PbB Equation1		Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario			
					Using Equation 1		Using Equation 2	
	1*	2**			GSDi = Hom	GSDi = Het	GSDi = Hom	GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	2902	2902	2902	2902
Rfetal/maternal	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSDi	X	X	Geometric standard deviation PbB	--	1.9	2.3	1.9	2.3
PbB0	X	X	Baseline PbB	ug/dL	1.4	1.8	1.4	1.8
IRS	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IRS+D		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
WS		X	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	1.0	1.0
KSD		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
AFS, D	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
EFS, D	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
ATS, D	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbBadult	**PbB of adult worker, geometric mean**			**ug/dL**	**5.6**	**6.0**	**5.6**	**6.0**
PbBfetal, 0.95	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**14.4**	**21.2**	**14.4**	**21.2**
PbBt	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
P(PbBfetal > PbBt)	**Probability that fetal PbB > PbBt, assuming lognormal distribution**			**%**	**14.2%**	**22.8%**	**14.2%**	**22.8%**

1 Equation 1 does not apportion exposure between soil and dust ingestion (excludes WS, KSD).

When IRS = IRS+D and WS = 1.0, the equations yield the same PbBfetal,0.95.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB adult =	(PbS*BKSF*IRS+D*AFS,D*EFS/ATS.D) + PbB0
PbB fetal, 0.95 =	PbBadult * (GSDi1.645 * R)

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB adult =	PbS*BKSF*([(IRS+D)*AFS*EFS*WS]+[KSD*(IRS+D)*(1-WS)*AFD*EFD])/365+PbB0
PbB fetal, 0.95 =	PbBadult * (GSDi1.645 * R)

Appendix K
Ecological Risk Assessment
Alternate Values

Table K-1
Alternate Values for ERA
Lab Area Remedial Investigation Report
Naval District Washington, Indian Head
Indian Head, MD

Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Inorganics										
Sediment	Fresh	Aluminum	--	25500	mg/kg	Buchman 1999	No BTAG value. Alternate value is the lowest ARCs Threshold Effects Level (TEL) for Hyallela azteca.			
Sediment	Fresh	Barium	--	500	mg/kg	Beyer 1990	No BTAG value. Alternate value is the Wisconsin Interim Sediment Quality Criterion for Great Lakes disposal (1985).			
Sediment	Fresh	Cobalt	--	50	mg/kg	Ontario Ministry of the Environment 1993	No BTAG value. Alternate value is the Ontario open water disposal guideline.			
Sediment	Fresh	Iron	--	188400	mg/kg	Buchman 1999	No BTAG value. Alternate value is the lowest ARCs Threshold Effects Level (TEL) for Hyallela azteca.			
Sediment	Fresh	Manganese	--	460	mg/kg	Ontario Ministry of the Environment 1993	No BTAG value. Alternate value is the Lowest Effect Level (LEL) based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms			
Sediment	Fresh/Marine	Chromium	5	81	mg/kg	Long et al. 1995	BTAG value derived from soil-based toxicity studies on tobacco. Alternate value is the ER-L for marine and estuarine sediments.			
Sediment	Fresh/Marine	Cyanide	--	0.1	mg/kg	Ontario Ministry of the Environment 1993	No BTAG value. Alternate value is the Ontario open water disposal guideline.			
Sediment	Fresh/Marine	Selenium	--	1	mg/kg	Buchman 1999	No BTAG value. Alternate value is based on the Apparent Effects Threshold (AET) for marine amphipods.			
Sediment	Fresh/Marine	Vanadium	--	57	mg/kg	Buchman 1999	No BTAG value. Alternate value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
Soil Fauna	--	Aluminum	--	600	mg/kg	Efroymson et al. 1997b	No BTAG fauna value. Alternate value is the approximate LOEC for effects to native soil microorganisms			
Soil Flora	--	Aluminum	1	50	mg/kg	Efroymson et al. 1997a	Basis for BTAG value is unknown. Alternate value derived from toxicity study on white clover in soil (LOEC).			
Soil Flora	--	Antimony	0.48	5	mg/kg	Efroymson et al. 1997a	BTAG value apparently based on background. Alternate value derived from toxicity study on various plants in soil.			
Soil Fauna	--	Arsenic	--	60	mg/kg	Efroymson et al. 1997b	No BTAG value for fauna. Alternate value is the approximate LOEC for earthworms based on one study with potassium arsenate.			
Soil Fauna	--	Barium	440	3000	mg/kg	Efroymson et al. 1997b	BTAG value based on USGS background data. Alternate value is the approximate LOEC for effects to native soil microorganisms.			
Soil Flora	--	Barium	440	500	mg/kg	Efroymson et al. 1997a	BTAG value based on USGS background data. Alternate value is a LOEC derived from 14-day studies using barley and bush beans.			
Soil Flora	--	Beryllium	0.02	10	mg/kg	Efroymson et al. 1997a	Source and basis of BTAG value unknown. Alternate value derived from soil toxicity studies with various plant species.			
Soil Fauna	--	Cadmium	2.5	20	mg/kg	Efroymson et al. 1997b	Basis for BTAG value unknown. Alternate value derived from results of 18 earthworm studies and ER L type value from 47 toxicity data points for soil microorganisms.			
Soil Flora	--	Cadmium	2.5	4	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value derived from results of 74 studies (wide range of species); value estimated to be equivalent to an ER-L.			
Soil Fauna	--	Chromium	0.0075	0.4	mg/kg	Efroymson et al. 1997b	BTAG value based on Canadian background data. Alternate value based upon survival in earthworms (most sensitive endpoint) exposed to Cr(VI) in soil/manure; 2 ppm LOEC with safety factor of 5.			
Soil Flora	--	Chromium	0.02	1	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value is the lowest EC50 from 2 studies using a variety of crop species and Cr(VI).			
Soil Fauna	--	Copper	--	50	mg/kg	Efroymson et al. 1997b	No BTAG value for soil fauna. Alternate value derived from the results of 24 earthworm studies using a variety of chemical forms and endpoints; value is approximately equivalent to an ER-L.			

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Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Soil Flora	--	Copper	15	100	mg/kg	Efroymson et al. 1997a	Basis for BTAG value is unknown. Alternate value is the approximate LOEC from 2 studies; LOEC based on CuSO4 and grass.			
Soil Fauna	--	Cyanide	0.005	0.06	mg/kg	Eisler 1991	Based on LOEC for adverse effects to a mixed microbial population plus a safety factor of 5.			
Soil Flora	--	Cyanide	--	27.5	mg/kg	MHSPE 1994	No BTAG value for flora. Alternate value is the mean of target and intervention values (Dutch soil standards) for total cyanide (pH >5).			
Soil Fauna	--	Iron	12	200	mg/kg	Efroymson et al. 1997b	BTAG value based on unadjusted oral ingestion exposure to rabbits. Alternate value based on the lowest effective concentration (280 ppm) from 9 studies with soil microorganisms.			
Soil Fauna	--	Lead	0.01	500	mg/kg	Efroymson et al. 1997b	BTAG value appears to be based on Japanese quail toxicity data but not on a back-calculated food web model. Alternate value is the LOEC for reproductive endpoints (6 studies) based on earthworm toxicity testing.			
Soil Flora	--	Lead	2	50	mg/kg	Efroymson et al. 1997a	Basis for BTAG values unknown. Alternate value is a LOEC derived from 17 values (several studies and plant species) and is approximately equivalent to an ER-L.			
Soil Fauna	--	Mercury	0.058	0.1	mg/kg	Efroymson et al. 1997b	BTAG value based on USGS background data. Alternate value based upon survival and reproduction in earthworms exposed to HgCl in soil; 0.5 ppm LOEC with safety factor of 5.			
Soil Flora	--	Mercury	0.058	0.3	mg/kg	Efroymson et al. 1997a	BTAG value based on USGS background data. Alternate value derived from soil toxicity studies with various plant species.			
Soil Fauna	--	Nickel	--	200	mg/kg	Efroymson et al. 1997b	No BTAG value for soil fauna. Alternate value is the approximate NOEC for reproductive endpoints from earthworm toxicity tests.			
Soil Flora	--	Nickel	2	30	mg/kg	Efroymson et al. 1997a	BTAG value based on single species. Alternate value is an approximate ER-L derived using 14 values from several studies.			
Soil Fauna	--	Silver	--	50	mg/kg	Efroymson et al. 1997b	No BTAG value for soil fauna. Alternate based upon the lowest effective concentration from 5 studies with soil microorganisms.			
Soil Flora	--	Silver	0.0000098	2	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value derived from soil toxicity studies with various plant species.			
Soil Flora	--	Thallium	0.001	1	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value derived from soil toxicity studies with various plant species.			
Soil Fauna	--	Vanadium	58	20	mg/kg	Efroymson et al. 1997b	BTAG value based on USGS background data. Alternate value based on the lowest effective concentration (23 ppm) from 10 studies of soil microorganisms; a NOEC of 30 ppm is also reported.			
Soil Flora	--	Vanadium	0.5	2	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value based on toxicity study with unspecified species of plants.			
Soil Fauna	--	Zinc	--	200	mg/kg	Efroymson et al. 1997b	No BTAG value for soil fauna. Alternate value is the approximate NOEC from 10 earthworm studies based on reproductive endpoints.			
Soil Flora	--	Zinc	10	50	mg/kg	Efroymson et al. 1997a	Basis for BTAG value unknown. Alternate value derived from results of 6 studies (several species); value estimated to be equivalent to an ER-L.			
Water	Fresh	Aluminum	25	87	ug/L	USEPA 1999	Basis for BTAG value unknown. Alternate value is the current chronic AWQC (pH range = 6.5 to 9.0) based on total aluminum.			
Water	Fresh	Arsenic	48	150	ug/L	USEPA 1999	Basis for BTAG value unclear. Alternate value is the current chronic AWQC (based on As+3 but applied to total arsenic).			
Water	Fresh	Barium	10000	1000	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Cadmium	0.53	0.80	ug/L	USEPA 1999	BTAG value based on old AWQC. Alternate value is the current, hardness-adjusted AWQC based on dissolved cadmium. The value shown is based on the minimum hardness of 25 mg/L but will be adjusted based on site-specific hardness values	25		
Water	Fresh	Chromium	2	11.0	ug/L	USEPA 1999	BTAG value based on unadjusted AWQC. Alternate value is the current AWQC based on dissolved chromium (hexavalent).			

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Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Water	Fresh	Cobalt	35000	23	ug/L	Suter and Tsao 1996	BTAG value based on acute endpoint. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Copper	6.5	2.74	ug/L	USEPA 1999	BTAG value not adjusted for hardness. Alternate value is the current AWQC based on dissolved copper adjusted for hardness. The value shown is based on the minimum hardness of 25 mg/L but will be adjusted based on site-specific hardness values.	25		
Water	Fresh	Lead	3.2	0.54	ug/L	USEPA 1999	BTAG value not adjusted for hardness. Alternate value is the current AWQC based on dissolved lead adjusted for hardness. The value shown is based on the minimum hardness of 25 mg/L but will be adjusted based on site-specific hardness values.	25		
Water	Fresh	Manganese	14500	120	ug/L	Suter and Tsao 1996	Basis for BTAG value unclear but appears to be based upon an acute endpoint. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Mercury	0.012	0.77	ug/L	USEPA 1999	BTAG value based on Final Residue Value. Alternate value is the current AWQC based on the Final Chronic Value, which reflects current USEPA policy.			
Water	Fresh	Nickel	160	16.1	ug/L	USEPA 1999	BTAG value not adjusted for hardness. Alternate value is the current AWQC based on total nickel adjusted for hardness. The value shown is based on the minimum hardness of 25 mg/L but will be adjusted based on site-specific hardness values.	25		
Water	Fresh	Silver	0.0001	0.36	ug/L	Suter and Tsao 1996	BTAG value long suspected of recording error. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Tributyltin	--	0.063	ug/L	USEPA 1999	No BTAG value. Alternate value is the currently proposed chronic AWQC.			
Water	Fresh	Zinc	30	36.5	ug/L	USEPA 1999	BTAG value is not referenced (no toxicological study is referenced nor is the value listed as an AWQC). Alternate value is the current freshwater chronic AWQC based on dissolved zinc and adjusted for hardness. The value shown is based on the minimum hardness of 25 mg/L but will be adjusted based on site-specific hardness values.	25		
Semivolatile Organics										
Sediment	Fresh	Benzo(k)fluoranthene	--	240	ug/kg	Ontario Ministry of the Environment 1993	No BTAG value. Alternate value is the Lowest Effect Level (LEL) based on Ontario sediments and benthic species; contaminant level that can be tolerated by the majority of benthic organisms.			
Sediment	Fresh/Marine	PAH (total)	--	4022	ug/kg	Long et al. 1995	No BTAG value. Alternate value is the ER-L for marine and estuarine sediments.			
Soil	--	1,2,4-Trichlorobenzene	100	1270	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on a LC50 for earthworms (from an artificial soil toxicity test) of 127 ppm (the lowest toxic concentration of 4 reported) and a safety factor of 100.			
Soil Fauna	--	1,4-Dichlorobenzene	100	1280	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on a LC50 for earthworms (soil toxicity test) of 128 ppm (lowest toxic concentration of 4 reported) and safety factor of 100.			
Soil Fauna	--	2,4,5-Trichlorophenol	100	4600	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on LC50 data for earthworms (soil toxicity tests; 12 values). Value is approximate ER-L (46 ppm) with safety factor of 10.			
Soil Flora	--	2,4,5-Trichlorophenol	100	430	ug/kg	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Alternate value is based on an EC50 from a 14-day toxicity test (growth endpoint) with lettuce (4.3 ppm) and a safety factor of 10.			
Soil Fauna	--	2,4,6-Trichlorophenol	100	580	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on a LC50 for earthworms (soil toxicity test) of 58 ppm (lowest toxic concentration of 5 reported) and safety factor of 100.			
Soil Fauna	--	2,4-Dichlorophenol	100	13400	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on LC50 data for earthworms (soil toxicity tests; 12 values). Value is approximate ER-L (134 ppm) with safety factor of 10.			

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Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Soil Flora	--	2,4-Dinitrophenol	100	20000	ug/kg	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Alternate value is a LOEC for 21-day toxicity tests (growth) with several crop species (20 ppm).			
Soil	--	2-Chloronaphthalene	--	1033	ug/kg	MHSPE 1994	No BTAG value. Alternate value is the mean of the detection limit and the intervention value (Dutch soil standards) based on the minimum TOC of 2% for organic chemicals. The value will be adjusted based on site-specific TOC (note that the recommended adjustment range for PAHs is 10 - 30%; 2% is used for conservatism).			2
Soil Fauna	--	4-Nitrophenol	100	380	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate is based on LC50 for earthworms (soil toxicity test) of 38 ppm (lowest toxic concentration of 5 reported) and safety factor of 100.			
Soil Flora	--	Acenaphthene	100	2500	ug/kg	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Alternate value based on an EC50 (25 ppm) from a 14-day toxicity test (growth endpoint) with lettuce and a safety factor of 10.			
Soil Flora	--	Diethylphthalate	--	13400	ug/kg	Efroymson et al. 1997a	No BTAG value available. Alternate value based on EC50 for lettuce (growth endpoint) in loam soil (134 ppm) and a safety factor of 10.			
Soil Fauna	--	Dimethyl phthalate	--	10640	ug/kg	Efroymson et al. 1997b	No BTAG value available. Alternate value based on LC50 for earthworms (artificial soil toxicity test) of 1064 ppm (lowest toxic concentration of 3 reported) and safety factor of 100.			
Soil Flora	--	Di-n-butylphthalate	--	200000	ug/kg	Efroymson et al. 1997a	No BTAG value available. Alternate value based on a LOEC derived from studies on corn and soybeans (21-day toxicity test).			
Soil Fauna	--	Fluorene	100	1700	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value based on a LC50 for earthworms (artificial soil toxicity test) of 170 ppm (lowest toxic concentration of 5 reported) and safety factor of 100.			
Soil Flora	--	Hexachlorocyclopentadiene	--	1000	ug/kg	Efroymson et al. 1997a	No BTAG value. Alternate value based on a EC50 (toxicity test; growth endpoint) for lettuce in loam soil (10 ppm) and safety factor of 10.			
Soil Fauna	--	Nitrobenzene	--	2260	ug/kg	Efroymson et al. 1997b	No BTAG value. Alternate value based on a LC50 for earthworms (14-day toxicity test) of 226 ppm (lowest toxic concentration of 4 reported) and a safety factor of 100.			
Soil Fauna	--	n-Nitrosodiphenylamine	--	1090	ug/kg	Efroymson et al. 1997b	No BTAG value. Alternate value based on a LC50 for earthworms (14-day toxicity test) of 109 ppm (lowest toxic concentration of 5 reported) and a safety factor of 100.			
Soil	--	PAH, total	--	4100	ug/kg	MHSPE 1994	No BTAG value. Alternate value is the mean of target and intervention values for 10 PAHs (Dutch soil standards) based on the minimum TOC of 2% for organic chemicals. The value will be adjusted based on site-specific TOC (note that the recommended adjustment range for PAHs is 10 - 30%; 2% is used for conservatism).			2
Soil Fauna	--	Pentachlorobenzene	100	1150	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on a LC50 for earthworms (soil toxicity tests) of 115 ppm (lowest toxic concentration of 4 reported) and a safety factor of 100.			
Soil Fauna	--	Pentachlorophenol	100	6000	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is an approximate ER-L value (30 ppm) derived using 22 values (mostly LC50s) for earthworms and a safety factor of 5.			
Soil Flora	--	Pentachlorophenol	100	3000	ug/kg	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Alternate value based on the lowest EC50 value from two soil toxicity studies with three species.			
Soil Fauna	--	Phenol	100	1880	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value based on a LC50 for earthworms (soil toxicity tests) of 188 ppm (lowest toxic concentration of 5 reported) and a safety factor of 100.			
Soil Flora	--	Phenol	100	7000	ug/kg	Efroymson et al. 1997a	BTAG value based on Canadian background concentration. Alternate value based on the lowest EC50 value from two soil toxicity studies with crop species and a safety factor of 10.			
Water	Fresh	2,4-Dimethylphenol	2120	530	ug/L	Federal Register 59:3762 (1994)	BTAG value based on acute endpoint. Alternate value is the 1994 proposed chronic Ambient Water Quality Criteria.			

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Water	Fresh	2-Chlorophenol	970	97	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	2-Methylphenol	--	13	ug/L	Suter and Tsao 1996	No BTAG value. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	2-Nitrophenol	--	150	ug/L	USEPA 1994	No BTAG value. Alternate value is the chronic AWQC (LOEL) for nitrophenols.			
Water	Fresh	4,6-Dinitro-2-methylphenol	--	2.3	ug/L	USEPA Region IV 1999	No BTAG value. Alternate value is the Region IV chronic screening value (factor of 100 applied to lowest acute toxicity value for 4 species).			
Water	Fresh	4-Bromophenyl-phenylether	--	1.5	ug/L	USEPA 1996	No BTAG value. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	4-Chloro-3-methylphenol	--	0.3	ug/L	USEPA Region IV 1999	No BTAG value. Alternate value is the Region IV chronic screening value (factor of 100 applied to lowest acute toxicity value for 1 species).			
Water	Fresh	4-Chloroaniline	--	50	ug/L	Buchman 1999	No BTAG value. Alternate value is based on a chronic LOEL reported by NOAA.			
Water	Fresh	Anthracene	0.1	0.73	ug/L	Suter and Tsao 1996	BTAG value not referenced. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Benzo(a)pyrene	--	0.014	ug/L	Suter and Tsao 1996	No BTAG value. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Benzoic acid	--	42	ug/L	Suter and Tsao 1996	No BTAG value. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	bis(2-Chloroethoxy)methane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	bis(2-Chloroethyl)ether	--	2380	ug/L	USEPA Region IV 1999	No BTAG value. Alternate value is the Region IV chronic screening value (factor of 100 applied to lowest acute toxicity value for 1 species).			
Water	Fresh	Butylbenzylphthalate	3	22	ug/L	USEPA Region IV 1999	BTAG value based on chemical class. Alternate value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest chronic LOEL value [2 species] and a safety factor of 10).			
Water	Fresh	Dibenzofuran	--	20	ug/L	USEPA 1996	No BTAG value. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Diethylphthalate	3	220	ug/L	USEPA 1996	BTAG value based on chemical class. Alternate value is based on the secondary chronic value for this specific phthalate derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Dimethyl phthalate	3	330	ug/L	USEPA Region IV 1999	BTAG value based on chemical class. Alternate value is based on the Region IV chronic screening value for this specific phthalate (based on the lowest acute toxicity value [2 species] and a safety factor of 100).			
Water	Fresh	Di-n-butylphthalate	0.3	33	ug/L	USEPA 1996	BTAG value based on chemical class. Alternate value is based on the secondary chronic value for this specific phthalate derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Di-n-octyl phthalate	0.3	3	ug/L	Buchman 1999	BTAG value with possible decimal error. Alternate value is the chronic LOEL for phthalates from NOAA summary.			
Water	Fresh	Fluoranthene	3980	398	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Isophorone	117000	11700	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Nitrobenzene	27000	2700	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	n-Nitrosodiphenylamine	5850	585	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Pentachlorophenol	13	6.7	ug/L	USEPA 1999	BTAG value not adjusted for pH. Alternate value is the current AWQC adjusted for pH. The value shown is for neutral pH (7.0) but will be adjusted based on site-specific pH values.		7.0	
Water	Fresh	Phenol	79	256	ug/L	USEPA Region IV 1999	BTAG value based on acute endpoint. Alternate value is the Region IV chronic screening value (chronic LOEL value and safety factor of 10).			

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Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Volatile Organics										
Sediment	Fresh/Marine	Trichloroethene	--	41	ug/kg	Buchman 1999	No BTAG value. Alternate value is based on the Apparent Effects Threshold (AET) for marine invertebrates from NOAA.			
Soil	--	1,2-Dichloroethane	870000	401	ug/kg	MHSPE 1994	BTAG value based on acute oral ingestion endpoint. Alternate value is the mean of the detection limit and the intervention value (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil Fauna	--	1,2-Dichloropropane	300	38800	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value based on LC50 for earthworms (soil toxicity test) of 3880 ppm (lowest toxic concentration of 5 reported) and safety factor of 100.			
Soil	--	4-Methyl-2-pentanone	100000	10000	ug/kg		BTAG value based on acute endpoint; safety factor of 10 applied to BTAG value.			
Soil	--	Benzene	100	105	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Bromochloromethane	3000000	300000	ug/kg		BTAG value based on acute endpoint; safety factor of 10 applied to BTAG value			
Soil	--	Bromodichloromethane	450000	45000	ug/kg		BTAG value based on acute endpoint; safety factor of 10 applied to BTAG value			
Soil Fauna	--	Carbon tetrachloride	300	1000000	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration data. Alternate value is the approximate LOEC for effects to native soil microorganisms.			
Soil Fauna	--	Chlorobenzene	100	2400	ug/kg	Efroymson et al. 1997b	BTAG value based on Canadian background concentration. Alternate value is based on a LC50 for earthworms (soil toxicity test) of 240 ppm (lowest toxic concentration of 4 reported) and safety factor of 100.			
Soil	--	Chloroform	300	1000	ug/kg	MHSPE 1994	BTAG value based on Canadian background concentration. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Ethylbenzene	100	5005	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Methylene chloride	300	1001	ug/kg	MHSPE 1994	BTAG value based on Canadian background concentration. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Styrene	100	10010	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Tetrachloroethene	300	401	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Toluene	100	13005	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Tribromomethane	1147000	114700	ug/kg		BTAG value based on acute endpoint; safety factor of 10 applied to BTAG value			
Soil	--	Trichloroethene	300	6000	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2
Soil	--	Xylene, total	100	2505	ug/kg	MHSPE 1994	BTAG value based on Canadian background data. Alternate value is the mean of target and intervention values (Dutch soil standards) based on the minimum TOC of 2%. The value will be adjusted based on site-specific TOC (adjustment range is 2 - 30%).			2

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Medium	Water Type	Chemical	BTAG Value	Alternate Value	Units	Reference	Comments	Hardness (mg/L)	pH	TOC (%)
Water	Fresh	1,1-Dichloroethane	160000	1600	ug/L		BTAG value based on 24-hour LC50; safety factor of 100 applied to lowest BTAG value.			
Water	Fresh	1,1-Dichloroethene	11600	1160	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	1,2-Dibromoethane	18000	180	ug/L		BTAG value based on 48-hour LC50; safety factor of 100 applied to lowest BTAG value.			
Water	Fresh	1,2-Dichloroethene (total)	11600	1160	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	2-Butanone	322000	14000	ug/L	Suter and Tsao 1996	BTAG value based on acute endpoint. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	2-Hexanone	428000	4280	ug/L		BTAG value based on 96-hour LC50; safety factor of 100 applied to lowest BTAG value.			
Water	Fresh	4-Methyl-2-pentanone	460000	4600	ug/L		BTAG value based on 24-hour LC50; safety factor of 100 applied to lowest BTAG value.			
Water	Fresh	Acetone	9000000	90000	ug/L		BTAG value based on LC50; safety factor of 100 applied to lowest BTAG value.			
Water	Fresh	Benzene	5300	530	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Bromochloromethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Bromodichloromethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Carbon tetrachloride	35200	3520	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Chlorobenzene	50	130	ug/L	USEPA 1996	BTAG value based on chemical class. Alternate value is based on the secondary chronic value for this specific chemical derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Chloromethane	--	5500	ug/L	USEPA Region IV 1999	No BTAG value. Alternate value is the Region IV chronic screening value (factor of 100 applied to the lowest acute toxicity value for 1 species).			
Water	Fresh	cis-1,2-Dichloroethene	11600	1160	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Dibromochloromethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Dibromomethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Dichlorodifluoromethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Ethylbenzene	32000	3200	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Methyl bromide	--	110	ug/L	USEPA Region IV 1999	No BTAG value. Alternate value is the Region IV chronic screening value (factor of 100 applied to the lowest acute toxicity value for 1 species).			
Water	Fresh	Methylene chloride	11000	2200	ug/L	Suter and Tsao 1996	BTAG value based on acute endpoint. Alternate value is based on the secondary chronic value derived using the USEPA Tier II Great Lakes methodology.			
Water	Fresh	Toluene	17000	1700	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	trans-1,2-Dichloroethene	11600	1160	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Tribromomethane	11000	320	ug/L	USEPA 1996	BTAG value based on acute endpoint. Alternate value is based on the secondary chronic value (derived using the USEPA Tier II Great Lakes methodology) from USEPA (1996).			
Water	Fresh	Trichlorofluoromethane	11000	1100	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Vinyl chloride	11600	1160	ug/L		BTAG value based on acute endpoint; safety factor of 10 applied to lowest BTAG value.			
Water	Fresh	Xylene, total	6000	130	ug/L	USEPA 1995	BTAG value based on human health effects. Alternate value is based on acute data cited in BTAG document with an acute to chronic safety factor of 100 applied.			